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UNIVERSITY CONTROL[1]

BOLOGNA and Paris are the archetypal universities from which all others have descended and from which they have in some measure inherited their present organization and methods. In the first decades of the twelfth century Irnerius lectured at Bologna on the civil law, and Abelard at Paris on philosophy and theology. There were at the same time other eminent teachers in those cities, and students were attracted from all parts of Europe. The students in a foreign city organized themselves into guilds for mutual protection and assistance in accordance with the custom of the time. These were the first universities. The lecturers, who had previously taught as the sophists at Athens and the rhetoricians at Rome, or as masters of music, dancing and gymnastics teach to-day, also organized themselves into societies or universities. There were no endowments; no academic buildings. The professors lectured at their homes or in

[1] This paper, more especially the collection of letters from university professors, was prepared for the faculties of the University of Illinois, and for discussion before their committee charged with drawing up a constitution for the university. Papers on the subject have also been presented before the Society of Sigma Xi of the University of Indiana, the Huxley Club of the Johns Hopkins University and at a joint meeting of the faculties of Lehigh University and Lafayette College. The fact that in the last two cases the presentation was in the form of an after-dinner address may account for the more frivolous and rhetorical passages, and for the use of the first personal pronoun. These might have been eliminated—they have been reduced—but a reformer should be concerned with accomplishing his ends rather than with conserving his dignity.

hired houses; the academic convocations were held in churches or monasteries. When there were difficulties with the city authorities or with their colleagues, a group of professors or students might migrate and found a new studium elsewhere. Thus in the thirteenth century offshoots from Bologna gave rise to studia at Reggio, Vicenza Arezzo, Padua, Vercelli and Siena. Oxford, the third of the great medieval universities, was probably due to a migration from Paris in 1167.

At Bologna the universities of students —who were men of maturity from all parts of Europe, as many as ten thousand at the end of the twelfth century, it is said— obtained control, lording it over the professors by means of the boycott. At Paris the students, organized into nations, were somewhat younger, and the professors, doctors or masters, as they were indifferently named, were in control. In one respect the conditions were curiously similar to the contemporary American university, for there was a college of arts of younger students, and professional schools of theology, law and medicine. We even read of an anticipation of present tendencies in that students had to receive the degree in arts before entering the medical school. About the middle of the thirteenth century there were established colleges of residence which were endowed as eleemosynary institutions for poor students, usually under the control of the church. In England the colleges were the property of the head and fellows, who had complete control of the establishment; on the continent they were somewhat less independent. In the course of time the differences became emphasized. The continental colleges became absorbed in the university and disappeared as halls of residence, whereas at Oxford and Cambridge the colleges practically constituted the university.

It is truly remarkable that there should have been some seventy-five universities throughout Europe before the time of the invention of the printing press and amid the incessant warfare of those days. One may wonder whether love of learning was not greater, intellectual curiosity keener, then than now. The students, numbered by the thousand—legend puts it as high as 30,000—flocked to a university attracted by the reputation of a great teacher. The rich came with their retinues, while the poor begged their way. Irnerius at Bologna, Roscellinus and Abelard at Paris, Grossetête and Roger Bacon at Oxford, were followed by long lines of great men, teachers, scholars, founders of science.

My main concern with the medieval university is that it was extraordinarily unhierarchical, democratic, anarchic, in its organization. The university was then, as it now should be, the professors and the students. The professors, of course, had complete control of the conditions under which degrees were given and in the selection of their colleagues and successors. The doctor earned the *jus ubique docendi;* he was not employed or dismissed. There was an elected council and rectors were elected for a year or for some other short period. Only later there came to be a single rector for the entire studium. The whole paraphernalia of the modern university—endowments, buildings and grounds, trustees and president, heads of departments and deans, curricula, grades and examinations—were absent or subordinated. There were indeed all sorts of routine, customs and limitations, but the university, in an age of feudalism and of absolutism of state and church, attained a remarkable freedom, and its great performance was in large measure due to this freedom.

It further seems to be the case that the waning of the influence of the university

in the course of time was largely due to the loss of freedom. As the universities obtained endowments and buildings, as their governing bodies became organized, they lost their spontaneity and creative leadership. The great philosophers, scholars and men of science of the seventeenth and eighteenth centuries worked in large measure outside the universities. Bacon, Hobbes, Locke and Berkeley; Descartes, Spinoza and Leibnitz; Harvey, Huygens and Laplace; Linnæus, Buffon, Lamarck and Cuvier; Lavoisier, Priestley and Dalton, were not university professors or not primarily such. Newton was, but he relinquished his chair at Cambridge to take a position in the mint at London. The men of science of the seventeenth and eighteenth centuries worked largely in connection with the academies of science, which were then established, and in the newly founded museums, observatories and botanical gardens. This movement is analogous to the contemporary establishment of research institutions outside the universities. There was too much dogmatism, formalism, discipline, routine, control, machinery—it might have been called efficiency if they had had the word in those days—in the university, and scientific men found greater freedom and stimulus in the academies, which, though under the patronage of the court, they themselves controlled.

Toward the close of the eighteenth century the universities throughout Europe had sunk to a low level. Within a period of a few years as many as thirteen German universities became extinct—Mainz, Cologne, Bamberg, Dillingham, Duisberg, Rinteln, Helmstedt, Salzburg, Erfurt, Altdorf, Frankfort, Ingolstadt and Wittenberg. But the new era of freedom and democracy, represented and caricatured by the French revolution, gave fresh life to the universities. The centralized scheme of Napoleon aggrandized Paris at the cost of the provincial universities, which only just now are regaining their autonomy. In Germany the modern university attained its fruition. The University of Berlin, established in 1809, when the political fortunes of Prussia were at low ebb, played a great part in the regeneration of the nation. It was partly founded on the basis of the existing Academy of Science, as was the University of Munich a little later. It is possible that our newer research institutions, if placed under the control of men of science, may become the freer universities of the future.

During the nineteenth century the German universities rivaled in their influence those of the medieval period. The advances of democracy and of science have been the great achievements of our era. In the advancement of science and to a certain extent in the maintenance of a democracy of scholarship, the German universities have been dominant forces. In Germany the university is indeed the creature of the state and subject to it. But during the nineteenth century academic freedom and the independence and influence of the professor attained a remarkable supremacy. Any student who showed ability could become a *Privatdocent;* if he continued to advance his subject with sufficient distinction and did not starve to death in the meanwhile he became a professor. The professorship has been maintained as a position of dignity, honor and freedom. The professor receives his appointment by the decision of his peers and holds it for life. He may lecture about as much or as little as he likes, on almost any subject, well or poorly as the case may be, with complete freedom in the expression of his views; he is but little concerned with grades, absences, discipline, routine reports, committee meetings and the like; he gives

much or little attention to his students as he may choose. The rector is elected annually by the professors. The curator, the representative of the government, the efficient man who runs things, is nowhere regarded as the intellectual or social equal of the professors.

All this might be supposed to lead to abuses; but the result is there to be seen by every one—the great scholars and men of science; the contribution to national progress and the civilization of the world. No efficient machine driven by the president of an American university can grind out such flour. I fear that the German university can not continue its great performance of the nineteenth century. This was doubtless more the result than the cause of the idealism of the people, now threatened with submergence under wealth and luxury. The modern German university must have its fine buildings, must grow greatly in size. This is inevitable, perhaps desirable. Laboratories, libraries and collections are required on a scale not formerly imagined; there is danger, perhaps need, of more administrative machinery, and the more machinery you have, the more you must get. It seems that the professors now tend to form a bureaucratic guild, too greatly concerned with their own financial status, and too little with the welfare of the docents and associate professors, of the students and of the people. The Prussian ministry is interfering more than formerly in the selection of professors and the management of things. The German emperor, it is said, wants presidents in the American style—we could spare him at least one for each of the twenty-one German universities.

It seems remarkable that in the bureaucratic little states which have since become the German empire, the universities should have been centers of liberal scholarship and free personalities. But it is perhaps generally the case that the finest exhibitions of the love of liberty and honor are made under persecution or where there are contrasted conditions. It is really quite difficult and discouraging to play the part of an academic hero or martyr now-a-days. One can do it better in Russia than in the United States. Thus a hundred professors at Moscow have recently resigned owing to some interference of the government with the liberty of the professors. In that country students and professors strike, and the government institutes lockouts. They take their liberties seriously, and the professors maintain their right to choose their colleagues and their deans and rectors.

The historic English universities, Oxford and Cambridge, have been primarily groups of independent colleges. The master and fellows are the college; they own the buildings and endowment and divide the income among themselves. They elect their colleagues and successors and of course their head. The headship is an honorary and social position with but few executive powers or duties. Government is by town meeting and committee. There have been abuses of the monastic system, and perhaps even now too much time is spent on details of management. But high standards of scholarship and conduct have on the whole been maintained. From among their resident fellows and from their students great men have been forthcoming in every line of activity. Probably half the leaders of England in statesmanship, scholarship, science, poetry, have come from its two universities, having together no more students than one of our larger institutions; and England has produced more great men than any other nation.

The universities of Oxford and Cambridge, as distinguished from their colleges, have long had a few endowed professorships and conducted libraries, but until

recently they were essentially degree-conferring institutions. They are administered by councils elected by the resident teachers, but the ultimate control is vested, as is becoming, in the masters of arts. The Church of England clergy have perhaps had more influence than is desirable, but their interference has in the main been confined to prescribing the conditions for the degree. In any case it is only a temporary phase, and a certain amount of conservatism is not so bad for a university. It would seem quite absurd to invest the ultimate control of Oxford and Cambridge in a self-perpetuating board, consisting of a score or larger crowd of business and professional men. The chancellorship is an honorary office, without executive power or influence, to which a non-resident graduate of distinction is elected. With the specialization of knowledge and the need of laboratories, the colleges could not give all the instruction needed, and the universities of Oxford and Cambridge are becoming increasingly teaching bodies. Parliament has required the colleges to give some part of their income to the support of the university. The professors are usually nominated by boards of electors, consisting of men of distinction in the subject or in related subjects, partly from the university and partly from outside. I have never heard of the expulsion of a fellow or professor. That a professor's salary should depend on the favor of a president or that he should be dismissed without a hearing by a president with the consent of an absentee board of trustees is a state of affairs not conceivable in an English or German university.

Harvard College was founded in 1636 by the general court of the Colony of Massachusetts Bay and placed under a board of overseers named by the court. In 1650 there was established a self-perpetuating corporation consisting of a president, a bursar and five fellows, which, however, was made responsible to the overseers. In 1865 the election of overseers was transferred from the legislature to the alumni of the college. The Collegiate School of Connecticut, subsequently named Yale College, was chartered by the legislature of the Colony of Connecticut in 1701 and placed under the control of trustees or partners, consisting of ten reverend ministers of the gospel. In 1745 the corporation received the title of The President and Fellows of Yale College. Later the governor, the lieutenant governor and six senators of the state were added to the fellows; in 1872 alumni trustees were substituted for the senators. The College of William and Mary was chartered in 1693 by the sovereigns whose names it bears. Princeton, Pennsylvania and Columbia, chartered, respectively, in 1746, 1751 and 1754, were placed under the control of boards of trustees, and, like Harvard and Yale, either at their inception or later, were controlled by the state and received appropriations from it. In my opinion it would have been better if the relation between the state and its university had been maintained.

The colonial college was largely modeled on the Cambridge college; thus the form of the Harvard and Yale corporations—the president and fellows—was directly borrowed. At Harvard the corporation included the teachers of the college; there was much protest the first time an alumnus was elected a fellow when there was a tutor eligible. It would be interesting to trace—did time and my competence permit—the steps through which our colleges slipped from the control of the state and of the graduates and teachers into the hands of small self-perpetuating corporations, until we reach the most reactionary

of all charters, that of 1810 for Columbia College, the provisions of which are as follows:

> The said trustees, and their successors, shall forever hereafter have full power and authority to direct and prescribe the course of study and the discipline to be observed in the said college, and also to select and appoint by ballot or otherwise, a president of the said college, who shall hold his office during good behaviour; and such professor or professors, tutor or tutors, to assist the president in the government and education of the students belonging to the said college, and such other officer or officers, as to the said trustees shall seem meet, all of whom shall hold their offices during the pleasure of the trustees. *Provided always,* That no such professor, tutor, or other assistant officer shall be a trustee.

The careers of our colleges were checkered by political and church dissensions; thus, in the case of Columbia, the subordination of the professors is in part explained by distrust of their episcopalian tendencies. It seems that the organization of our colleges was influenced not only by the college of the English universities, but also by the English endowed public school, to which it came to bear a greater resemblance.

The University of Virginia was established as a state institution by the legislature in 1819. Under the influence of Jefferson the continental university was to a certain extent followed; and both in educational and administrative methods there was much that was admirable—at least from my point of view. Under the general control of a board, the affairs of the university were administered by the faculty and its elected chairman, until after eighty years souls were once more sold for gold. The University of Indiana was established in 1820, the University of Michigan in 1837, as part of the public educational system of those states, the governing bodies being elected boards. Here was inaugurated a new movement in higher education, destined, I trust, to parallel the great performance of the medieval university and of the German university. The institutions of the Atlantic seaboard having slid into capitalistic control, there has arisen in the central west a system of higher education directly responsive to the will of the people on whose support it depends.

Prior to the last quarter of the nineteenth century, we had colleges and professional schools, but no university. Yale, it is true, first offered the doctorate of philosophy in 1860, and in the early seventies the degree was given by Harvard, Columbia and Cornell. But the graduate work of a faculty of philosophy was not organized or emphasized until the opening of the Johns Hopkins University in 1876, when there arose an institution nearer to my conception of what a university should be than any elsewhere in this country or than it has been able to remain. Buildings, administration and routine instruction were subordinated to great men who attracted from the whole country the students who were to be the future leaders. In the organization of the Johns Hopkins Medical School in 1893 a contribution of nearly equal significance was made in placing the professional school on a university basis. The past two or three decades have witnessed an almost incredible growth of our universities. Columbia has now 700 instructors, 7,000 students, fifty million dollars. In spite of the materialistic standards and autocratic methods of control which this paper emphasizes—perhaps overemphasizes with a view to their correction—the development of the American university, especially of the state university, is one of the greatest achievements of our people, promising moral, social and intellectual leadership and supremacy in the course of the present century.

If here or elsewhere I have expressed

opinions which seem lacking in appreciation of what is being accomplished in this country for higher education and for the advancement of science, this is only because it is not possible to put in each paragraph or even in a single paper everything that one believes. The most useful forward movements and the greatest men are subject to just criticism. It is only when the work has been accomplished and the men are dead that we may forget the faltering and the errors and eulogize the good that has been done. In our educational and scientific work, as in our business, social and political life, we must oppose with all our power the materialistic aims and autocratic usurpations which are the not unnatural accompaniments of the development of the vast resources of a new country and the passing from aristocratic to democratic control. As I wrote[2] before the present democratic movement had gathered its existing force:

> The applications of science—which in the first instance made democracy possible by supplying the means of subsistence with possible leisure and education for all—have in their recent developments enormously complicated modern civilization. Our methods of communication, transport and trade, of manufacture, mining and farming, have led to the doing of things on an immense scale. The individual has once more been subordinated, crudely commercial standards prevail, and control has been seized by the strong and the unscrupulous. Those of us who are not ashamed to profess faith in democracy regard all this as a temporary phase, which will only last until intelligence has developed equal to the complexity of the environment. The only real danger is that instincts may become atrophied before reason is ready to take their place.
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> The trust promoter and insurance president, the political boss and government official, the university president and school superintendent, have assumed powers and perquisites utterly subversive of a true democracy. The bureaucracy is defended on the ground of efficiency; but efficiency is not a final cause. To do things is not a merit regardless of what they are, and bigness is not synonymous with greatness. There is no ground for hopelessness. Of the things done the good may last and the rest may be eliminated; bigness may become greatness. The organizers of our huge corporations have in a way made history prematurely; these vast combinations were inevitable; the trouble is that they have come before we are ready to manage them. We have no evidence that people are less competent, honest and kindly than they were; it is the difficulties and the temptations that have increased.
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> There is ground for maintaining that the methods of the business corporation and the political machine have been somewhat wantonly applied to educational administration in this country. On the one hand, educational institutions are not and need not become so big and complex as to require the sacrifice of freedom to supposed efficiency, and, on the other hand, those who are the university—the teachers and the students who are or have been under their influence—have far more than average intelligence. . . .
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> In stating frankly views that are shared by a larger proportion of my colleagues than is generally supposed, I by no means wish to adopt the attitude of a pessimist. I know well from personal experience with what unfailing courtesy and ceaseless effort a university president may conduct the affairs of his difficult office. Much has been accomplished for higher education in the United States. As the industrial trusts will in the end be directed by the world's greatest democracy for the benefit of the people, so our educational system may give the material basis for an efflorescence of creative scholarship springing from a free and noble life.

My own academic experience has been mainly in the endowed institutions of the Atlantic seaboard. My father was president of Lafayette College from 1863 to 1883, during which period the teachers increased from nine to thirty, the students from 60 to 300, and the property from $50,000 to $1,000,000. There the personal and patriarchal system of college control was exhibited at its best. It doubtless now flourishes in many small institutions throughout the country as in the English public schools. A man such as Mark Hop-

[2] "The University and Business Methods," *The Independent*, December 28, 1905.

kins or Thomas Arnold has been the soul of the institution. As Matthew Arnold writes in "Rugby Chapel"

> . . . to thee was it given
> Many to save with thyself;
> And, at the end of thy day,
> O faithful shepherd! to come,
> Bringing thy sheep in thy hand.

As a fellow at the Johns Hopkins University at the zenith of its great achievement, I had again opportunity to witness the system of presidential autocracy under favorable conditions. The university was dominated by one man who was personally responsible for and to its dozen professors and two hundred students. But the patriarchal system is of necessity limited to the small institution, and it is scarcely fitted to the democracy of the twentieth century. In a residence of six years at European universities, I had experience of the educational system, but though I was assistant at the University of Leipzig and lecturer at the University of Cambridge, I was at that time indifferent to administrative methods. These have been increasingly forced on my attention since my appointment as professor at the University of Pennsylvania and lecturer at Bryn Mawr College, and for the twenty years during which I have been professor at Columbia University.

I reviewed the problems of university control in a short article printed in SCIENCE some six years ago. This was reprinted with certain added footnotes, and at the beginning of December sent to our leading men of science, who hold or have held academic positions, with the following note:

> Would you be willing to give your opinion of the plan of university control here proposed? If you are so kind as to do so, I shall understand that I may quote anonymously your reply.

About 300 replies have been received, which are printed practically in full as an appendix to this paper. The article on which the replies were based is as follows:

UNIVERSITY CONTROL[3]

In the colleges from which our universities have developed the problem of administration was comparatively simple. The faculty and the president met weekly and consulted daily; each was familiar with the work of the entire institution; a spirit of cooperation and loyalty naturally prevailed. The trustees also understood the economy of the college and were able to work intelligently for the general good. But when a university covers the whole field of human knowledge, when it is concerned with professional work in divergent directions, when it adds research and creative scholarship to instruction, when both men and women are admitted, when there are 500 instructors and 5,000 students, it is no longer possible for each trustee and for each professor to share intelligently in the conduct of the whole institution. We appear at present to be between the Scylla of presidential autocracy and the Charybdis of faculty and trustee incompetence. The more incompetent the faculties become, the greater is the need for executive autocracy, and the greater the autocracy of the president, the more incompetent do the faculties become. Under these conditions it appears that the university must be completely reorganized on a representative basis. It should not be a despotism and it can not be a simple democracy. Autonomy should be given to the schools, departments or divisions. The administrative, legislative and judicial work must be done by experts, but they should represent those whom they serve. . . .

The present writer ventures to propose tentatively the following form of organization for our larger universities, to be reached as the result of a gradual evolution:[4]

[3] Reprinted from SCIENCE, for March 23, 1906, with footnotes added in November, 1911.

[4] No sensible person would attempt to reform suddenly by a paper constitution a system which has developed in response to its environment. The boss in politics, the trust magnate in business, the university president and school superintendent, have probably conduced to a certain kind of efficiency and to an enlargement more rapid than would otherwise have been possible. What a community does is dependent on the men who compose it rather than on the laws under which they live. But a bad system may demoralize the cooperative spirit of the group and may select for it individuals who are not the most desirable. The danger of our present system of university control is that

1. There should be a corporation consisting of the professors and other officers of the university, the alumni who maintain their interest in the institution and members of the community who ally themselves with it.[5] In the case of the state universities part of the corporation would be elected by the people. This corporation should elect trustees having the ordinary functions of trustees—the care of the property and the representation of the common sense of the corporation and of the community in university policy.[6] The trustees should elect a chancellor[7] and a treasurer who would represent the university in its relations with the community.

2. The professors or officers, or their representatives, should elect a president who has expert knowledge of education and of university administration. His salary should not be larger, his position more dignified or his powers greater than those of the professor.[8]

3. The unit of organization within the university should be the school, division or department, a group of men having common objects and interests, who can meet frequently and see each other daily. It should be large enough to meet for deliberation and to represent diverse points of view, but small enough for each to understand the whole and to feel responsible for it. The size of this group is prescribed by a psychological constant, its efficient maximum being about twenty men and its minimum about ten.[9]

4. Each school, division or department should elect its dean or chairman and its executive committee, and have as complete autonomy as is consistent with the welfare of the university as a whole.[10] It should elect its minor officers and nominate its professors. The nominations for pro-

it tempts a man to play for his own hand and selects for academic work men lacking in character, individuality and genius.

[5] A large corporation of this character places the ultimate control on a democratic basis. The members would pay annual dues, and a considerable income would thus accrue. A large number of individuals would take an active interest in the welfare and development of the institution. In the case of the state universities the people of the state are in a sense the corporation with ultimate control, and it might be undesirable to establish an intermediate body. Still the state might delegate its powers to such a corporation, and a society of members of the university might be formed, even though the regents or trustees were elected by the people or appointed by their elected governors.

[6] The trustees or regents of an American university have absolute powers, but tend to delegate them to the president. They place a limit on the amount of money that can be spent and sometimes use their reserve powers even in matters of educational detail. When the corporation is small, as at Harvard, it may be in active control of policies. In the private chartered institutions it is usually large, its members having but little knowledge of educational problems or of the special university under their control. There are often several trustees who take an active, though not always a wise, interest in the university, and it is a delicate problem of the president to manage such trustees. One of the most serious difficulties of the present situation is that the president owes his office, salary and powers to the trustees and must obtain their favor, whereas he is not responsible to the faculties. The professor is likely to owe his office and salary to the president, and is sometimes placed in a position that is humiliating.

[7] It might or might not be an advantage to have a chancellor, such as exists in the British universities, a man of prominence in the community, who would obtain endowments and represent the university at public functions.

[8] It may be that no president is desirable other than an annually elected rector, as in the German universities. If, however, the president were elected by the faculties for a limited term and made responsible to them, the academic situation would be greatly improved. The argument of efficiency can be adduced in favor of giving autocratic powers to one individual, but the university is the last place where such system should prevail. It is neither necessary nor desirable that things be done in haste. Administrative details can be handled promptly by a clerk or secretary. Men and women should not be subject to the judgment or whims of an individual. Security, permanence, honor, the slow growth of traditions, are essential to a true university.

[9] Such autonomy is usually possessed by medical, law and technical schools forming a part of a university. It should be extended to other divisions when they become sufficiently large. Partly independent institutions for teaching or research can to advantage form part of a university. The separately endowed colleges of the English universities have certain advantages.

[10] In the department-store system, which is likely to prevail in our universities, the junior professors and instructors are responsible to the head of the department and are dependent on him for advances in office and salary, while the heads of departments are in like position in relation to the dean or the president, the heads of departments and deans being named by the president. The active committees are appointed by the president; in one of our leading universities even faculty members are named by the president from among the professors, making the faculty a presidential committee. This procedure reverses the proper or, at all events, the democratic method of control, according to which officers are chosen by those whom they serve and leaders are followed because they are acknowledged as such.

fessorships should be subject to the approval of a board of advisers constituted for each department, consisting, say, of two members of the department, two experts in the subject outside the university and two professors from related departments. The final election should be by a university senate, subject to the veto of the trustees. The same salaries should be paid for the same office and the same amount of work. The election should be for life, except in the case of impeachment after trial.[11] The division should have financial as well as educational autonomy. Its income should be held as a trust fund and it should be encouraged to increase this fund.

5. The departments or divisions should elect representatives for such committees as are needed when they have common interests, and to a senate which should legislate for the university as a whole and be a body coordinate with the trustees. It should have an executive committee which would meet with a similar committee of the trustees. There should also on special occasions be plenums of divisions having interests in common and plenums of all the professors or officers of the university.[12] There should be as much flexibility and as complete anarchy throughout the university as is consistent with unity and order.

It seems that the 299 replies expressing the opinion of the writers on this paper represent with considerable accuracy the existing academic sentiment in this country among those who have been most successful in their work. They are all from men in the natural and exact sciences, who form somewhat less than half our university professors, but there is no reason to suppose that their colleagues in other departments would differ as a class in their attitude on academic questions. I wrote to scientific men because I had a list of those of highest standing and am personally acquainted with most of them. It may be that in some cases men were more likely to reply because they agreed with my views and were more likely to emphasize their agreement than their dissent. As a psychologist by trade, I judge, however, that this is more than balanced by the opposite tendency to react by objecting and to argue against a proposition proposed. Probably the replies of younger men and of less successful men would be more radical and more opposed to the existing system of university control.

The letters are well worth a careful reading. We are told that every question has two sides; as a matter of fact many questions are polygons. The problems of the administration of an educational institution have many sides and many angles. They differ completely in the small college and in the large university, in the newer and in the older institutions, in the state university and in the private corporation. My paper was written with reference to the large endowed universities, especially those which have enjoyed or suffered a rapid growth in size and scope. The replies are from institutions of all kinds. Those who hold chairs in the smaller colleges may find a system fairly adequate to their needs which would be undesirable in our large universities. Those in state universities may regard as

[11] The greatest possible care should be exercised in the selection of professors. Instructors and lecturers should be freely admitted to the university, but the professorship should be maintained as a high office. The alternative to permanence of tenure is competition for prizes under honorable conditions, but in this case salaries must be as large as the incomes of leaders in law, medicine and engineering. It is more economical and probably conduces to greater dignity and honor to pay adequate but moderate salaries with permanence of tenure, as in the army or the supreme court. Advances in salary should be automatic, as at Harvard, but there might to advantage be a few professorships with comparatively high salaries—the same as that of the presidency—vacancies in which would be filled by cooptation or by election by the faculties.

[12] Professors and other officers should not be distracted from their work of teaching and research by administrative politics. But they should select their administrative officers and legislative committees and have opportunity to make proposals and vote on questions of educational policy. Voting by mail and the fly-leaf method of discussion of the English universities could be adopted to advantage. An elected executive committee of the faculties meeting with the executive committee of the trustees is a feasible method of improving the existing academic situation.

necessary a strong executive responsible to the people and professors subordinated to the public service, when they would not approve of the irresponsible autocracy of the private corporations. Professors at Harvard and Yale may take satisfaction in the long traditions and wise precedents which obtain at these universities, when they would not care to live under the system in use at Columbia and Chicago.

It was originally my intention to base this paper on an analysis of the letters received, but the exigencies of an engagement made it necessary to prepare its first version before the proofs could be obtained, the letters written and the replies received. It is indeed somewhat difficult to summarize such a large number of points of view which represent both real differences of opinion and differences due to the fact that various situations were under consideration. It seems best to print the letters, and to permit those interested to draw their own conclusions. The letters will be given under the institution from which they come when there are as many as ten replies, the institutions otherwise being grouped. In general, the letters are placed in the order of their preference for the existing system of university control which I designate as a limited autocracy. Omissions have been made from some of the longer letters and, formal compliments, apologies and the like have been erased. Thus a large percentage of all letters begin with the phrase "I have read with interest," etc. Other slight editorial revision, such as eliminating the paragraphs, has been undertaken, but every effort has been made not to alter in the slightest degree the opinions expressed. There is given here a table showing the source of the replies and the only classification that I shall attempt to make. Its validity can be judged by those who care to read the letters.

	Limited Autocracy Present System	Greater Faculty Control	Representative Democracy; Plan Proposed	Total
Harvard	9	6	11	26
Yale	1	6	4	11
Columbia	2	2	10	14
Pennsylvania	0	3	9	12
Johns Hopkins	0	2	14	16
Chicago	1	0	17	18
Cornell	0	4	8	12
Mass. Inst.	3	4	3	10
New England	6	6	12	24
Middle States	3	4	21	28
Col. for Women	1	2	5	8
Southern	1	3	9	13
Michigan	0	3	7	10
Wisconsin	5	4	4	13
Minn. Ill. Mo. Cal.	5	5	18	28
C. & W. State	2	7	14	23
C. & W. Private	7	7	16	30
Anonymous	0	1	2	3
Total	46	69	184	299

Of the 299 replies 46 are taken as favoring the system usual in this country, which is designated as a limited autocracy, 69 as favoring a system in which the faculties have greater share in control, as at Yale or the Johns Hopkins Medical School, 184 as favoring a plan of representative democracy more or less similar to the one proposed. Five sixths of those holding the most important scientific chairs at our universities believe that there should be a change in administrative methods in the direction of limiting the powers of the president and other executive officers and making them responsible to those engaged in the work of teaching and research. This is an agreement greater than I had anticipated. When eighty-five per cent. of those responsible for the conduct of a given system unite in holding that it should be altered, the case may be regarded as strong. Political and social changes are usually made on a much narrower majority. It is true that five of the six presidents who replied—they are of course

at the same time men who formerly did distinguished scientific work—form part of the minority. Indeed, a large percentage of this minority consists of presidents, directors, deans and other university officials.[13] Whether this should be interpreted as that much in favor of the present system, or that much more against it, may be left an open question.

A considerable number of professors at Harvard favor the existing system, but their preference applies to their own situation, where the administrative autocracy is tempered. Of 19 replies from Wisconsin and Illinois, eight favor a limited autocracy, but they have in mind their system, which is not the same as that of the private universities. Probably they would in any case prefer the methods of President Van Hise and President James to those of President Draper. Those who want a strong executive responsible to the people of the state have been classed in the group favoring a limited autocracy. Thus the two replies from Columbia which are placed in this group are from men who do not trust faculty control, though, as I happen to know, they are by no means satisfied with the existing situation. If these two cases are omitted, we find that of 70 replies from Columbia, Pennsylvania, Cornell, Johns Hopkins and Chicago—these are the institutions which I had especially in mind in my proposals—only one (an executive officer) favors the existing system, eleven favor greater faculty control, and 58 a complete change which would make the administration responsible to the faculties. This is surely a condition which foretells reform or bankruptcy.

J. McKeen Cattell

(To be continued)

[13] Eighteen of the replies are from men who formerly held academic positions but are now connected with research institutions, the government service, etc., or who while holding professorships are principally engaged in other work. These replies show about the same distribution as the others, three in the first group, four in the second and eleven in the third. They are classed under the institutions with which the men are or were connected. Two replies from those previously connected with universities as teachers, but somewhat incidentally, have been omitted. They both belong to the third group.

ABBOTT LAWRENCE ROTCH[1]

Abbott Lawrence Rotch was born in Boston, January 6, 1861, the son of Benjamin Smith and Anna Bigelow (Lawrence) Rotch. He was graduated from the Massachusetts Institute of Technology (S.B.) in 1884. In 1891 Harvard recognized the importance of the work which he had already accomplished by bestowing upon him the honorary degree of A.M. From 1888 to 1891, and again from 1902 to 1906, he held the appointment of assistant in meteorology at Harvard, a position which involved no teaching and in which no salary was paid. In 1906 he was appointed professor of meteorology, an honor which he prized very highly, and which gave him the position on the teaching staff of the university to which he was in every way fully entitled. He was the first professor of meteorology who has occupied that position at Harvard, and he served in this professorship without pay. In the year 1908–09, at the request of the department of geology and geography, he generously put the splendid instrumental equipment and library of Blue Hill Observatory at the service of the university, by offering a research course ("Geology 20f") to students who were competent to carry on investigations in advanced meteorology. This action on the part of Professor Rotch gave Harvard a position wholly unique among the universities of the United States. It brought about a close affiliation, for purposes of instruction and of research, between the university and one of the best-equipped meteorological observatories in the world. To his work as instructor Professor Rotch gladly gave of his time and of his means. He fully realized the unusual ad-

[1] An appreciation of Professor A. Lawrence Rotch, based on the same material, appears also in the *Harvard Graduates' Magazine*.—R. DeC. W.

vantages which he was thus enabled to offer those students who were devoting themselves to the science of meteorology, and the experience of the men who had the privilege of his advice and help in the work at Blue Hill shows clearly how much they profited by this opportunity. Only a short time before his death he had expressed the wish to bring about a still closer connection, for purposes of instruction, between the university and Blue Hill Observatory. He thus showed his appreciation of the importance of the new field of work which he had undertaken.

While thus planning still further usefulness for his observatory; in the midst of a life singularly active; with an ever-widening sphere of scientific influence and a constantly increasing importance of his contributions to meteorology, Professor Rotch died suddenly in Boston on April 7, 1912, in the fifty-second year of his age. His wife, who was Miss Margaret Randolph Anderson, of Savannah, Ga., and three children survive him.

Professor Rotch early developed that absorbing interest in meteorology which caused him to devote his life to the advancement of that science. Possessed of large means, he preferred to work persistently, and not infrequently to undergo discomfort and hardship in his chosen field of research, rather than to live a life of ease. Realizing the need of an institution which could be devoted to the collection of meteorological observations, and to meteorological research, free from any entanglements, he established, in 1885, Blue Hill Observatory. This was first occupied by Mr. Rotch and his observer, Mr. W. P. Gerrish, on February 1, 1885. This observatory he not only equipped and maintained until his death, but he made provision in his will for having the work there carried on without a break. Blue Hill Observatory is to-day one of the few private meteorological observatories in the world, and there is not one which is better equipped. In fact, it is probably safe to say that there is no private scientific establishment which is better known for the high standard of its work. The Blue Hill Observatory was, with the exception of the municipal meteorological station in New York, the first in this country to be equipped with self-recording instruments, and it is to-day one of the comparatively few in the world where nearly every meteorological element is continuously recorded. Beginning with 1886, hourly values have been printed. Professor Rotch took a splendid pride in his observatory, and in its equipment, and his library, to which he devoted constant care, was one of the most complete and valuable in the world.

Professor Rotch early realized that the advance of meteorology must come through a study of the free air, and with keen and prophetic judgment he planned and carried out the remarkable series of investigations which have made Blue Hill so famous. He secured assistants who were well fitted to carry out the researches which he planned and supervised. He thus showed his ability to judge the value of men, as well as his capacity to organize the work for them to do. Mr. H. H. Clayton became a member of the Observatory staff in 1886, and served, as observer and meteorologist, with some interruptions, for twenty-three years. His work brought distinction to himself and to the observatory. Mr. S. P. Ferguson joined the staff in 1887, and remained there until 1910. Many new instruments were devised by him, and perfected with care and success. Mr. A. E. Sweetland died after eight years of service and was succeeded, in 1903, by Mr. L. A. Wells, who is now observer-in-charge, with Mr. A. H. Palmer as research-assistant. Year after year the Blue Hill publications have contained results of far-reaching importance. It is not an exaggeration to say that much of the recent rapid advance of meteorological science is due to the pioneer work which was done at Blue Hill.

Under an arrangement entered into between Blue Hill Observatory and the Astronomical Observatory of Harvard College, Professor Rotch was, for nearly twenty-five years, closely associated with the latter institution. All of the observations made at Blue Hill were published in the *Annals* of the Harvard Observatory, and fill eight quarto volumes.

The international form of publication, and metric units, were first used in the United States in the publications of the Blue Hill Observatory.

It was one of Professor Rotch's most striking characteristics that he never neglected any opportunity which might help him to keep his observatory not only abreast of the times but ahead of the times. He thought nothing of the time and the expense of taking a trip to Europe in order to attend some scientific meeting, meteorological or aeronautical, if he believed, as he most firmly did, that he might by so doing gain inspiration and new ideas. Few scientific men are so regular in their attendance at congresses and meetings; few contribute so much that is new or gain as much inspiration as he did at such gatherings. It was not the blind following of the dictates of his New England conscience that prompted him to be so regular in his meetings with his scientific colleagues. His motive was a higher one than that. It was his absorbing desire to advance his science by every means within his power. The list of scientific bodies of which he was a member was a long one, but every one of them gained much from his membership and from his presence at its meetings. He was regular in his attendance; always ready to contribute papers; always modest in his estimate of the importance of his own work; always generous in his appreciation of the work of others; always ready with a word of sympathy, or encouragement, or fellowship.

The productivity of Blue Hill Observatory has been remarkable, especially when it is remembered that this activity was the result of the support and inspiration of one man. The study of cloud heights, velocities, movements and methods of formation at Blue Hill was one of the most complete investigations of the kind ever undertaken. The first series of measurements in America of the height and velocity of clouds, by trigonometrical and other methods, was made at Blue Hill in 1890–91. These measurements were repeated in 1896–97, as a part of an international system.

It was at Blue Hill that the modern methods of sounding the air by means of self-recording instruments lifted by kites were first developed and effectively put into practise (1894), methods which have now been adopted by meteorological services and scientific expeditions in all parts of the world. The use of cellular kites flown with steel wire and controlled by a power windlass originated at Blue Hill. Grants for carrying on this kite work were obtained from the Hodgkins Fund.

It was Rotch who, in 1901, during a voyage across the Atlantic, first obtained meteorological observations by means of kites flown from the deck of a moving steamer, thus indicating the feasibility of a new way of securing information concerning the conditions of the free air over oceans and lakes. It was Rotch who, in 1904, secured the first meteorological observations by means of sounding balloons from heights of 5 to 10 miles over the American continent, and who, in 1909, made the first trigonometrical measurements of the flight of pilot balloons in the United States. In 1905–06 he joined his colleague, Teisserenc de Bort, in fitting out and taking part in an expedition to explore the tropical atmosphere over the Atlantic Ocean by means of kites and pilot balloons, an undertaking which resulted in the collection of important data regarding the temperatures and movements of the upper air. But Rotch was not content with merely sending up kites and balloons. His enthusiasm in the study of the free air, and his desire to visit the mountain observatories of the world, led him to become a mountain climber of no mean ability. He ascended to the summit of Mont Blanc at least five times, and in South America and elsewhere he himself made meteorological observations at considerable altitudes on mountains, and carefully observed the physiological effects of the diminished pressure. He also took part in several balloon ascents, and was a member of more than one solar eclipse expedition. His studies of eclipse meteorology are among the most complete which have been made. Among his many contributions to the advancement of meteorology must also be mentioned his in-

vention of an instrument for determining the true direction and velocity of the wind at sea.

Professor Rotch was naturally intensely interested in the recent rapid development of aeronautics. His earlier training at the Massachusetts Institute of Technology, and his untiring zeal in the exploration of the upper air, combined to give him this interest. He turned his attention largely in that direction of late years. It was characteristic of him that, not content with the mere collection of data, and with investigations of theoretical interest, he always strove to make these results of practical use. Thus, soon after the establishment of his observatory, the issue of local weather forecasts was begun, and one of the last things which he published (in association with Mr. A. H. Palmer) was a set of "Charts of the Atmosphere for Aeronauts" confined to meteorology, and show most embodying many of the results of observations made at Blue Hill in a practical form for the use of airmen.

Professor Rotch's list of published papers and books comprises 183 titles. These cover a wide range of subjects, by no means strictly confined to meteorology, and show most emphatically how varied were their author's interests; how extended was his reading; how alert and progressive he was in all he undertook. These 183 titles in themselves furnish a satisfactory outline of the development of meteorological science during the past 25 years. In addition to the "Charts of the Atmosphere" just referred to, he published two other books, "Sounding the Ocean of Air" (1900) and "The Conquest of the Air" (1909).

Professor Rotch gave his support freely to a large number of scientific societies and undertakings. He was one of the pioneer and most enthusiastic members of the New England Meteorological Society. He was, for more than ten years (1886–96), one of the associate editors and one of the mainstays of the *American Meteorological Journal,* which did a unique work for American meteorology. He was a member of the Astronomical and Astrophysical Society of America; a fellow and of late years librarian of the American Academy of Arts and Sciences; a member and trustee of the Boston Society of Natural History; a member of the American Philosophical Society, of the Physical Society of London, of the International Solar Commission, of the International Commission for Scientific Aeronautics, of the International Meteorological Committee; fellow of the Royal Meteorological Society (London); member of the Société Météorologique de France, of the Deutsche Meteorologische Gesellschaft, of the Oesterreichische Gesellschaft für Meteorologie and of many other societies.

He was lecturer at the Lowell Institute, in Boston, in 1891, and again in 1898. He was a member of the International Jury of Awards at the Paris Exposition (1889), and was then made a Chevalier of the Legion of Honor. He received the Prussian Orders of the Crown (1902) and Red Eagle (1905) of the Third Class in recognition of his services in advancing the knowledge of the atmosphere. The latest evidence of the high regard in which his scientific work was held abroad was his selection, by the French ministry of public instruction, as exchange professor at the Sorbonne for the year 1912–13. The official letter announcing this selection arrived in this country within a very few days after Professor Rotch's death.

He was a pioneer in a new science; an investigator, whose name is known wherever meteorological work is done; a loyal teacher who served without salary; a generous benefactor, who left to the university an enduring monument of his enthusiasm and untiring devotion to the science which he himself did so much to advance. His life and labor have been an inspiration to his scientific colleagues everywhere, but especially to those who were most closely associated with him in the work of his observatory, and in the department of the university of whose staff he was a valued member.

ROBERT DE C. WARD
HARVARD UNIVERSITY

THE TRANSCONTINENTAL EXCURSION OF THE AMERICAN GEOGRAPHICAL SOCIETY

The American Geographical Society of New York celebrates this year the occupation of its new building on Broadway at 156th Street and the sixtieth anniversary of its founding. No form of celebration seemed so fitting as an excursion across the United States, in which an invited party of European geographers should make the journey in company with a number of American geographers, who would show the visitors the most significant of our geographical features; the excursion to be closed by a meeting in New York, when the visitors should be invited to give some account of what they have seen.

The plan thus outlined is now approaching its realization. The leading geographical societies of over a dozen European countries have been requested to select from among their members a number of proficient geographers whom the American Geographical Society may welcome on the excursion. The list thus constituted, with the addition of a few names otherwise invited, now includes over forty geographers from sixteen different countries; most of the delegates being professors in universities or officers of national geographic societies. The character of the party will be sufficiently indicated by announcing the coming of Partsch and Drygalski, Merzbacher and Jaeger, of Germany; Gallois, Margerie and Vacher, of France; Chisholm, Beckit and Falconer, of Great Britain; Niermeyer and Oestreich, of Holland; Lecointe, of Belgium; Beltrán, of Spain; Silva-Telles, of Portugal; Brückner and Oberhummer, of Austria; Cholnoky and Teleki, of Hungary; Cvijič, of Servia; Doubiansky and Schokalsky, of Russia; Andersson, of Sweden; Olufsen, of Denmark; Brunhes, Chaix and Nussbaum, of Switzerland, and Calciati, Marinelli and Vinceguerra, of Italy. It is safe to say that no such gathering of geographical crowned heads has ever been brought from Europe to America.

The Americans already enlisted, either as round-trip or as temporary members, include, among professors of geography, Barrows and Cowles, of Chicago; Brigham, of Colgate; Bowman, of Yale; Davis and Ward, of Harvard; Dodge and Johnson, of Columbia; Fenneman, of Cincinnati; Jefferson, of Ypsilanti, and Martin and Whitbeck, of Wisconsin, as well as a number of scientific men from various parts of the country representing subjects allied to geography. Professor W. M. Davis, of Harvard University, has been appointed director of the excursion. The party as now made up includes over fifty round-trip members and some twenty or more temporary members. The number of participants is still to be somewhat enlarged, and correspondence (addressed to the director, Transcontinental Excursion American Geographical Society, Broadway at 156th Street, New York) is therefore invited from proficient geographers (men only) who may desire to take part in the excursion for longer or shorter periods, and who can aid the American members already enlisted in explaining our geographical features to the European members. Place on the special train in which the excursion will be made can not be promised to all applicants, but it is hoped that all professional geographers who wish to take part in the excursion can be accommodated in one or another part of the route. The excursion train will leave New York about August 22, and return in the early part of October.

The route of the excursion includes Niagara, Detroit, Chicago, Madison, St. Paul-Minneapolis—probably Duluth and the Iron region—the Yellowstone Park, Spokane, Seattle, Tacoma, Portland—probably San Francisco, possibly the Yosemite Valley—Salt Lake City, Grand Junction, Denver, Albuquerque, the Grand Canyon of the Colorado in northern Arizona, Kansas City, St. Louis—possibly Memphis, Birmingham and Chattanooga—Washington and New York. Numerous stops will be made at points of geographical interest on the way. A most generous hospitality is promised at many places, where the party will be entertained in local clubs and taken about in automobiles. The cities of the far northwest are particularly

active; they are planning to take the excursionists up Mt. Rainier through the superb forest that clothes the lower slopes of this great volcano, to the hotel situated near the timberline, whence the glaciers of the higher slopes may be seen; and also to Crater Lake, the waters of which occupy a huge cavity of engulfment in a once lofty volcano, one of the most remarkable features of the west, although as yet not widely known. Two days will be spent in Washington, where visits will be made to various scientific bureaus of the government. The final meeting in New York will be made the occasion of a more general invitation than can be given for a limited excursion on a railway train; and at that time, it is desired that the European geographers should have opportunity of meeting a large number of their American colleagues. Due announcement will be made of the place and date of this final meeting, as well as of the speakers and the subjects that they will treat.

SCIENTIFIC NOTES AND NEWS

AT the meeting of the London Institution of Electrical Engineers on May 16, a marble bust of the late Lord Kelvin was presented to the institution on behalf of Lady Kelvin.

SOME of the associates and students of Dr. Simon Flexner during the period from 1899 to 1904, when he was professor of pathology at the University of Pennsylvania, have presented to the university a portrait showing Dr. Flexner in his laboratory, painted by Adele Herter, of New York City.

AT the annual meeting of the American Academy of Arts and Sciences, held on May 8, 1912, it was voted, upon the recommendation of the Rumford Committee, to award the Rumford premium to Frederic Eugene Ives for his optical inventions, particularly in color photography and photo-engraving.

THE Bessemer gold medal of the British Iron and Steel Institute has been awarded to Mr. John Henry Darby. Mr. Darby's connection with the iron and steel trades is best known from his association, as far back as in the year 1880, with the introduction of the basic process. The first open-hearth furnaces for the manufacture of steel on a large scale erected in Great Britain were those built under Mr. Darby's superintendence at Brymbo.

THE congratulations of the council of the Chemical Society, London, have been offered to Mr. E. Riley, who has completed sixty years of fellowship, and to Major C. E. Beadnell, R.A., Mr. H. O. Huskisson and Mr. F. Norrington, who, during 1911, attained their jubilee as fellows.

MR. MARK A. CARLETON, for the past eighteen years in charge of grain investigations in the Bureau of Plant Industry, and well known as the introducer and propagator of Durum wheat and the Swedish select oat, has resigned his present position to take charge of the work of the Pennsylvania Chestnut Tree Blight Commission.

MR. C. E. CRAIG, instructor in agronomy in Purdue University, has accepted the position of agronomist in the Polytechnic School at Porto Alegre, Brazil.

DR. MAURICE J. BABB, assistant professor of mathematics at the University of Pennsylvania, has been elected president of the Association of Teachers of Mathematics of the Middle States and Maryland.

MR. H. C. K. PLUMMER has been elected, as we learn from *Nature,* by the board of Trinity College, Dublin, to be royal astronomer in Ireland, in succession to Dr. E. T. Whittaker, who was recently elected professor of mathematics at Edinburgh University. Mr. Plummer is the son of Mr. W. E. Plummer, director of the Liverpool Observatory, and has been second assistant to Professor H. H. Turner at the Oxford University Observatory since 1901.

AT the annual meeting of the British Institution of Civil Engineers, held on April 30, the following were elected president and vice-presidents: *President,* Mr. Robert Elliott-Cooper; *vice-presidents,* Mr. A. G. Lyster, Mr. B. H. Blyth, Mr. J. Strain and Mr. G. Robert Jebb. The council of the institution has made the following awards for papers read

during the session 1911–12: Telford gold medals to Messrs. E. and W. Mansergh; a George Stephenson gold medal to Mr. R. T. Smith; a Watt gold medal to Mr. A. H. Roberts; Telford premiums to Messrs. J. Goodman, A. B. McDonald, G. M. Taylor, D. C. Leitch, W. C. Easton and D. H. Morton; and the Manby premium to Mr. S. H. Ellis.

At his own request and on account of physical disability, after a steady teaching service of over thirty-six years, by vote of the board of regents of the University of Minnesota, Arthur E. Haynes, professor of engineering mathematics, has been retired. The board has passed the following resolution: "Voted to express the appreciation of the board not only of the professional services of Professor Haynes, but of his personal devotion, his influence for the highest type of living and his loyalty to the university."

Mr. Walter E. Archer, C.B., who, as assistant secretary, has been in charge of the Fisheries Division of the Board of Agriculture and Fisheries since its establishment in October, 1903, has been compelled to retire from the public service owing to ill-health. His retirement took effect on May 1.

It is stated in *Nature* that the services of the official guide to the collections at the British Museum, Bloomsbury, have been so highly appreciated that a similar officer has been appointed, experimentally, at the Natural History Museum, South Kensington. Mr. J. H. Leonard has been selected for the position. The guide will make two tours of the museum daily, each tour lasting an hour. Provision will also be made for special tours, and for these, special application will have to be made.

The consul general of Uruguay and six members of a commission of agricultural engineering are visiting our colleges of agriculture. The commission is on a world tour to study agriculture in different countries.

Professor Henry B. Ward spoke on May 8 before the Medical Research Club of Cincinnati on "Recent Discoveries of Value in the Accurate Diagnosis of Human Parasites," illustrating the talk with material from the zoological research laboratory of the University of Illinois. On May 10 he delivered the convocation address at the University of Cincinnati on the topic "The Prolongation of Life." While in Cincinnati he met with the committee of the university on the formulation of a constitution and at the request of President Charles W. Dabney discussed some of the general problems involved in this work.

Professor Lauder W. Jones, University of Cincinnati, lectured before the students of chemistry, Central University of Kentucky, Danville, on Friday, May 10, his subject being "Some Historic Text-books and their Authors."

On May 14 Professor W. Bateson gave the first of two lectures at the Royal Institution on "The Study of Genetics."

It is proposed to endow a pathological laboratory at St. Vincent's Hospital, New York, as a memorial of Dr. William Francis Norman O'Loughlin, the senior medical officer of the *Titanic,* in which he went down after rendering all possible assistance in saving others. Dr. O'Loughlin had been forty years in the service of the White Star Line.

Prince Damrong, minister of the interior in Siam, has founded a Pasteur Institute in memory of his daughter, who died of hydrophobia.

Sir Frederick Wallace, an eminent London surgeon, has died at the age of fifty-three years.

The death is also announced of M. Eugene Caventou, the distinguished organic chemist, president of the Paris Academy of Medicine in 1897.

There is existing a vacancy in the position of chief of drainage investigations in the Office of Experiment Stations, Department of Agriculture, Washington, D. C., at a salary of about $4,000 per annum. The government is endeavoring to find the best man available for this work and has no particular individual in view. Applications for the examination will be accepted until June 10. Applicants should have a broad training in civil engineer-

ing; experience in making and passing upon drainage surveys and plans, with special reference to the requirements of the drainage of large tracts of agricultural lands; familiarity with drainage laws and administrative organization, cost of construction of drainage systems, etc. They should also be qualified to plan and conduct research along drainage lines, and to make reports and prepare publications on drainage subjects. Five years' experience as a drainage or hydraulic engineer, exclusive of any similar experience obtained in connection with university studies, is a prerequisite for consideration for this position.

THE U. S. Civil Service Commission also announces an examination to fill a vacancy in the position of assistant pharmacologist in the Bureau of Chemistry, at $1,800 to $2,000 per annum. This position affords opportunity for study and research in pharmacology and physiology in the broadest sense, the laboratory equipment being of the best. The person appointed to this position, if he proves capable of conducting the work, may expect reasonable promotion.

AN invested fortune yielding $100,000 annually, a palatial mansion on the Boulevard Haussmann, and one of the finest private art collections in Europe have been bequeathed to the Institute of France by Mme. Edouard André.

THE Austrian government has purchased for about $600,000 the only two radium mines at Joachimsthal which were owned by private individuals. It is estimated that the two mines will yield annually about 3 grams of radium. Plans are under way for the development of Joachimsthal as a resort for the treatment of disease by radium.

A PARTY will leave Cornell University on May 25 for the purpose of investigating the biology of the Okefenokee Swamp in southeastern Georgia. The fauna and flora of this extensive and in many respects unique swamp have heretofore almost entirely escaped the attention of naturalists. The eastern part of the swamp consists of vast inundated "prairies," while on the western side there are extensive heavily wooded islands. Much of the swamp is a sphagnum bog, whence the Indian name, originally spelled "Ouaquaphenogaw," meaning "trembling-earth." The personnel of the party will consist of Professors C. R. Crosby and J. Chester Bradley, Dr. A. H. Wright, Messrs. M. D. Funkhouser, M. D. Leonard, A. R. Cahn and S. C. Bishop, of Cornell University, and F. Lee Worsham, state entomologist of Georgia. Dr. Wright and Mr. Cahn will give their attention to the vertebrates, and Mr. Cahn also to collecting fleas and Mallophaga. An extensive series of blood smears will be made, for the detection of blood-parasites. The other members of the party will devote their attention to insects, especial attention being given to aquatic forms. The party expect to remain in the swamp from eight to ten weeks.

Two more American professors will start in a short time on a trip around the world under the Kahn Foundation for the Foreign Travel of American Teachers. They are William Erskine Kellicott, Ph.D., professor of biology in Goucher College, Baltimore, Md., and Ivan Mortimer Linforth, A.B., A.M., professor of Greek in the University of California, their appointment having been made this week. The fellowships to which they have been appointed carry with them a stipend of $3,000 each, and an additional $300 for the purchase of souvenirs, books, etc. The fellowships are unique in that the incumbents are required only to make the trip around the world. The choice of routes, countries visited and length of stay in any one place are left to the discretion of the fellows, their only duty being to see as many peoples and countries as possible. The object of the founder was to give teachers an opportunity to carry on their work from a broader and more international point of view. The first appointments on this foundation were made last year. Francis Daniels, A.B., A.M., Ph.D., professor of Romance languages at Wabash College, Crawfordsville, Ind., and John Hanson Thomas McPherson, A.B., Ph.D., professor of history and political science at the Univer-

sity of Georgia, are now abroad, and are due to reach this country during the summer months. The foundation was established by M. Albert Kahn, of Paris, France, and is administered by Edward D. Adams, Nicholas Murray Butler and Henry Fairfield Osborn, of New York City, Charles W. Eliot, of Cambridge, Mass., Charles D. Walcott, of Washington, D. C., and Frank D. Fackenthal, secretary of Columbia University, as secretary of the board.

The Bureau of American Ethnology of the Smithsonian Institution has issued a dictionary of the Biloxi and Ofo languages, accompanied by texts of a number of stories embodying mythology and folklore of the two tribes. This volume is largely the result of painstaking investigation and study on the part of the late Rev. J. Owen Dorsey, to which Dr. John R. Swanton, of the bureau, has added the Ofo material, besides arranging and editing (from the linguistic point of view) the entire work.

Messrs. Witherby & Co. are shortly publishing "A Hand-list of British Birds," giving a detailed account of the distribution of each bird in the British Isles, and a general account of its range abroad, together with details of the occurrences of rarities. The Hand-list is the joint work of Messrs. E. Hartert, F. C. R. Jourdain, N. F. Ticehurst and H. F. Witherby.

Experiments have been carried out at Nawalia, Northern Rhodesia, respecting the transmission of human trypanosomes by *Glossina morsitans* Westw., and on the occurrence of human trypanosomes in game. The results, so far as they are at present ascertained, are presented by Mr. Allan Kinghorn and Dr. Warrington Yorke in the "Annals of Tropical Medicine and Parasitology," issued by the Liverpool School of Tropical Medicine, forming the first interim report of the Luangwa Sleeping Sickness Commission, British South Africa Company. The summary of the report as given in the London *Times* is as follows: (1) The human trypanosome, in the Luangwa Valley, is transmitted by *Glossina morsitans* Westw. (2) Approximately 5 per cent. (4.76) of the flies may become permanently infected and capable of transmitting the virus. (3) The period which elapses between the infecting feed of the flies and the date on which they become infective is approximately 14 days. (4) An infected fly retains the power of transmitting the disease during its life, and is infective at each meal. (5) Mechanical transmission does not occur if a period of 24 hours has elapsed since the infecting meal. (6) Some evidence exists to show that in the interval between the infecting feed and the date on which transmission becomes possible the parasites found in the flies are non-infective. (7) *Glossina morsitans*, in nature, has been found to transmit the human trypanosome. (8) Certain species of buck, viz., waterbuck, hartebeest, mpala and wart-hog, have been found to be infected with the human trypanosome. (9) A native dog has been found to be infected with the human trypanosome.

UNIVERSITY AND EDUCATIONAL NEWS

Mrs. John Stewart Kennedy has given to New York University a Hall of Philosophy, costing in the neighborhood of $90,000. It is to be known as the Cornelius Baker Hall of Philosophy in memory of Mrs. Kennedy's father, who was one of the founders of the university.

Oberlin College has received an anonymous gift of $10,000 for library endowment. It is expected that a considerable portion of this will be devoted to completing the files of scientific periodicals and journals, with especial emphasis on the contemporary literature on Eugenics.

The King of Siam has sanctioned a scheme for the establishment of a University of Bangkok. There will be eight faculties, including medicine, law, engineering, agriculture, commerce, pedagogy and political science.

The Experiment Station Record states that an agricultural school is to be established in Melilla, Morocco, under Spanish auspices. This school will have for its objects the dis-

seminating of practical instruction regarding improved methods, and their demonstration upon the estate, which will be conducted as a model farm, and also on demonstration fields in adjoining sections. It is estimated that about $48,000 for buildings and equipment, and $21,000 annually for maintenance, will be required.

THE William Rainey Harper Memorial Library at the University of Chicago is to be dedicated on June 10 and 11, 1912. A special effort will be made to have the alumni attend the dedicatory exercises, which will be held in Harper Court, bounded on the south by the Library, on the west by Haskell Oriental Museum, and on the east by the Law Building. For the next few years the first floor of the new building will be used for class-rooms and will also contain the Harper Assembly room. Eventually, however, the entire floor is to be utilized as a stack-room.

THE trustees of Cornell University have voted to approve the recommendation of the faculty of the College of Agriculture and the university faculty to grant hereafter the degree of bachelor of science, instead of bachelor of science in agriculture, for the completion of the course in the College of Agriculture.

AT Princeton University, William F. Magie, Henry professor of physics, has been elected dean of the faculty to succeed Professor H. B. Fine. Professor Fine retains the deanship of the department of science. He will spend the coming academic year in Europe.

DR. M. E. WADSWORTH, for the past five years dean of the School of Mines of the University of Pittsburgh, has resigned, his resignation to take effect on June 30. Mr. S. A. Taylor, C.E., an alumnus of the university, has been appointed dean.

PROFESSOR H. P. BAKER, of the Pennsylvania State College, has accepted a position at Syracuse University as dean of the State College of Forestry, established in 1911 by the New York legislature with an initial appropriation of $55,000.

PROFESSOR RICHARD S. CURTIS, of the University of Illinois, has resigned to become professor of organic chemistry at the Throop Polytechnic Institute, Pasadena, California, and L. L. Burgess, associate in chemistry, has resigned to become assistant professor of analytical chemistry at the University of Saskatchewan, Canada.

THOMAS C. BROWN, Ph.D. (Columbia, '09), assistant professor of geology in the Pennsylvania State College, has been appointed associate in geology at Bryn Mawr College.

MR. R. J. S. PIGOTT has been appointed assistant professor of steam engineering in Columbia University, a newly established position in the School of Engineering.

H. LEE WARD, of Swarthmore College, has been appointed instructor in chemistry in Wesleyan University.

THE following new appointments to instructorships have been made in the department of chemistry of Columbia University: Andrew Bender, Columbia University; R. H. Lombard, Columbia University; Arthur Edgar, Massachusetts Institute of Technology; Dr. Frederick Barry, Harvard University; R. F. McCrackan, Columbia University; Harry L. Fisher, Cornell Medical School; Robert M. Isham, Columbia University.

PROFESSOR FRIEDRICH CZAPEK, of the University of Prague, has been appointed to the chair of plant physiology and pathology in the Imperial College of Science and Technology, London.

DISCUSSION AND CORRESPONDENCE

A PROTEST AGAINST CHANGING THE INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE

IT is well known to all who have had to deal with questions of nomenclature that much of the confusion in the application of generic names in the past has been due to the lack of system in determining the type of a genus.

It is a matter of small importance just how the type is determined so long as every one uses the same method and the method is sufficiently clear and definite to yield uniform results in the hands of different investigators.

The method of elimination which was for some time in use was unsatisfactory in this respect. It proved impossible to formulate rules by which the type of a composite genus could be "eliminated" by several investigators with the same result.[1]

Systematists naturally demanded a simpler method which would give uniform results in the hands of different persons, and the "first species" method met with very general support when the question of a change was raised. The matter came before the International Commission on Zoological Nomenclature at Boston in 1907 and resulted in the adoption, as a compromise, of the method now incorporated in the Code, whereby the action of the first author who designates a type for a polytypic genus is held as binding in all cases where the type is not settled by original designation, tautonymy, etc., as enumerated in Art. 30, rules "*a*" to "*d*."

This method is definite and has been accepted by all zoologists who follow the International Code. The types of thousands of genera have been recently determined by this method and many complicated questions of nomenclature have been settled in accordance with its rules. The Commission, with the cooperation of subcommittees, has even begun to prepare lists of authoritative names for genera in various departments of zoology, based upon the rules now in use.

Zoologists began to feel that stability and uniformity were at last in sight—but no! We are recently in receipt of a circular signed by a number of European zoologists advocating a return to the method of elimination and urging that the proposition be brought, not before the Commission on Nomenclature, but before the entire Zoological Congress!

It is hard to see how any zoologist can seriously support such a proposition, especially at the present time, when such satisfactory progress toward stability was being made. It is of course permissible to change the Code of Nomenclature where the rules are obscure or indefinite; but if we are to shift back and forth to accommodate the views of now one coterie of investigators, now another, we might as well abolish all codes and lapse into nomenclatural chaos.

The return to the elimination method would not only reestablish the chaos in generic names from which we are just emerging, but would undo all the careful work in type determination which has been accomplished in the past five years as well as shake our faith in the permanency of any action of the Commission.

The proposition, moreover, to bring such questions before the entire Congress instead of the Commission on Nomenclature is preposterous. The determination of questions of nomenclature can only be effected by men who have had long experience in this line of work and many members of the Congress who are not systematists have little or nothing to do with nomenclature. For this very reason the Commission was appointed by the Congress and now to propose to ignore it is little short of insult.

One can not but suspect that some of the signers of this petition have been influenced by the entirely erroneous plea that the changes in well-known generic names are all due to the present method of type determination and that the return to elimination would restore the familiar names. Nothing is farther from the truth. Every method of type determination will involve changes in generic names and probably in about equal numbers, but the greatest number of changes is due not to the method type designation nor yet to priority, but to excessive generic subdivision. There would probably be a great protest were it proposed to overthrow the genus *Picus*, the classic name for woodpeckers, but, as a matter of fact, such action would affect the name of but one species of bird, as all other woodpeckers have been removed from this genus!

It is to be hoped that zoologists attending the Zoological Congress at Monaco in 1913 will realize the seriousness of this matter and not permit a technical question of this kind to be taken outside of the Commission on Nomenclature expressly established for its

[1] Cf. Science, Vol. XXIV., p. 560.

consideration; and further that the members of the Commission will not countenance a change in the Code which is both uncalled for and unnecessary, and which will render void much valuable work and threaten the success of the whole movement toward uniformity in zoological nomenclature.[2]

WITMER STONE
THE ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA,
May 7, 1912

"GENES" OR "GENS"?

AFTER discussing the significance of the word "phenotype" in SCIENCE for April 26, Dr. O. F. Cook states that

> Pluralizing the word "gen" is another difficulty encountered by geneticists. Johannsen used the term mostly in its German plural form, *Gene*. Our writers have added another letter making a double plural, "genes," something like "memorandas."

This statement does not correctly represent the origin of the English word "gene" and its plural "genes," now generally used by writers of English papers on genetics. In Darwin's word "pangen" English usage renders the last syllable short, though the two halves of the word contribute equally to its meaning. When the word is transferred to the German, as has been freely done, a law of the German language makes both syllables long. On this account the German word *"Pangen"* better expresses the meaning involved than does the English word "pangen." Johannsen's word *"Gen,"* like the last syllable of the German word *"Pangen,"* from which it was directly derived, is long in quantity. On transferring this happily chosen word to English it was desired to maintain the long quantity of the German word, and the addition of a final *e*, following a general law of English philology, was made simply for this purpose. The English word "gene" (pronounced gēn) is thus seen to bear no direct genetic relation to the German plural *"Gene,"* and their likeness in spelling is purely a coincidence. The word "genes" is consequently not a double plural and not at all like "memorandas."

There is a further reason why the word "gene" should be preferred. This word must be used commonly in the plural form, but there is already a word "gens" in rather common literary use and having, at least sometimes, a genetic meaning.

Regarding the definition of "phenotype," few who carefully read the passage translated by Dr. Cook from Johannsen's book will agree with the translator that "phenotype" as used by its author was ever anything but an abstraction. "Centers among series of variations around which the variants are grouped" must always be abstractions, and yet they are, as Johannsen rightly says, "measurable realities." Every individual organism possesses an external appearance and a fundamental constitution, and is therefore a representative of some phenotype and of some genotype. The words "phenotype" and "genotype" were never intended to be limited to *statistically investigated* organisms. Statistical investigation may *discover, measure* and *describe* phenotypes, but it does not *create* them. Phenotypes and genotypes exist among Mendelian hybrids just as among all other organisms, and my use of the Mendelian categories to illustrate the proper use of these two words involves no "new version of phenotype."

G. H. SHULL
COLD SPRING HARBOR, L. I.,
April 29, 1912

CRYSTALLOGRAPHIC TABLES

TO THE EDITOR OF SCIENCE: The letter of Professor Oliver Bowles, of the University

[2] Since the above was written I have read Professor Nutting's article in SCIENCE criticizing the powers of the commission and the difficulty of bringing a question of nomenclature before the congress for discussion. He fails to realize that these very facts give the code its strength and establish confidence in the permanency of nomenclature based upon it. We do not desire rules that appeal to this man or that, but rules that shall be *permanent* and the International Congress was perfectly right in making it as difficult as possible to change the code.—W. S.

of Minnesota, which appeared in a recent issue of SCIENCE,[1] opens up again the much discussed question of the presentation of the subject of crystallography to undergraduate classes.

Professor Bowles apparently takes the view that the fundamental laws of this science should be studied through their application to concrete examples. It has been the experience of the writer that, in general, the efforts of teachers of crystallography have not been directed with sufficient force to the lucid presentation of these fundamental laws. In spite of the many varieties of models in glass, wood, paper and plaster of Paris, now at the disposal of the modern teacher of this science, his classes often have only a vague notion of:

1. The mechanical relations of the directions of particle-attraction.

2. The all importance of symmetry as a basis of crystallographic study.

3. The application of the above to crystallographic zones.

With regard to Professor Bowles's suggestion respecting tables for determination of axial ratios, the writer desires to point out that the use of such tables must of necessity presuppose the knowledge on the part of the student of which face of the crystal measured represents a unit plane. Taking the axial ratios of a number of common tetragonal minerals such as:

	$\dot{c}$	$2\dot{c}$	$3\dot{c}$
Apophyllite	1.2515		
Wernerite	.4384		1.3052
Zircon	.6404	1.2808	
Rutile	.6441	1.2882	
Cassiterite	.6723	1.3446	
Xenotime	.6187	1.2374	

it will be readily seen that for each of these species a pyramid could be selected which would give a resulting axial ratio fairly close to some pyramid of each of the others. In point of fact, in the above series the difference in angle, measured from the prism, between the pyramid corresponding to 1.2374 (lowest value) and 1.3446 (highest value) is only 5¾°—a difference not easy of determination with a contact goniometer in the hands of an inexpert student. Such instances could be multiplied many times.

In answer to Professor Bowles's first question as to whether tables of axial ratios would be useful as an aid to crystal determination with the reflection goniometer, it has been the writer's experience (and undoubtedly that of every crystallographic investigator) that in 99 cases the name of the species under investigation is known before it is set up for measurement. In the rare and much to be desired hundredth case (that of a new species) the name would obviously not appear in any table.

To the chemical crystallographer, tables of the axial ratios of artificial crystals might be of use could a work of sufficient size to include them all be prepared, but even such a collection of tables would have to be very frequently revised.

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[1] SCIENCE, April 12, 1912, pp. 576–577.

TO THE EDITOR OF SCIENCE: If we may judge from the character of most of the text-books on crystallography, Mr. Bowles's suggestion in SCIENCE for April 12, that any phase of this subject should be turned into an "illuminating and interesting exercise" is certainly a novel one. Yet surely the demonstration of the "value of the science as a means of mineral determination" is the ideal way to bring it before the student, so that crystals shall be to him more than, as Goldschmidt has put it,[1] "a feared and hated collection of geometrical figures, of wood, plaster or pasteboard, with vertices and edges and bad Greek names, to be immediately forgotten on leaving school, and preferably never heard of again."

The writer has used tables similar to those described by Mr. Bowles for several years; thus far they have been mimeographed and handed around the class, but if elaborated and

[1] *Ann. d. Naturphilos.*, IX., 121.

collected into book form they would certainly be still more serviceable. The inclusion of all known minerals would be a very desirable feature, but the more important ones should be marked by bold-face type.

The necessity for repetition of each species would be in a large measure obviated if a complete discussion of the rules governing the orientation of crystals in general were presented. Even in the tetragonal system two values of ċ must be given unless the student is first taught to distinguish first from second order pyramids, by relative size of faces, presence of cleavage, direction of striations, etc. And in the more complex systems similar rules can be formulated. In fact, if such rules had only been collected and presented in an authoritative way in some text-book long ago the rather unfortunate confusion in the present usage in orienting even some common crystals—as, for instance, making the long prism-like faces of gypsum the pyramid—might have been avoided.

Yes, by all means, the preparation of such a list of tables should be undertaken. And perhaps it would be worth while to include similar tabulations of some of the physical properties of minerals, such as color, hardness, etc., on a more elaborate scale than those in Dana's text-book, for instance.

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CHANGES OF BODILY FORM IN DESCENDANTS OF IMMIGRANTS

TO THE EDITOR OF SCIENCE: Four years ago Professor F. Boas, of Columbia University, was intrusted by the U. S. Immigration Commission with an investigation of the bodily characteristics of descendants of immigrants in America. The results of this undertaking were published two years ago in his report entitled "Changes in Bodily Form of Descendants of Immigrants" (Washington, 1910). In this report Dr. Boas questions the generally accepted theory of anthropologists that the form of the head is one of the most unchanging characteristics of human races, and concludes that it is subject to "far-reaching" changes in type due to the transfer of the races of Europe to American soil.

Last year I wrote a critique of this report entitled "Professor Boas's New Theory of the Form of the Head—A Critical Contribution to School Anthropology,"[1] in which I took the ground that Professor Boas's own figures do not warrant his conclusion that the shape of the head is influenced by a new environment.

In a recent number of SCIENCE[2] there appeared a reply to my critique. As the general reader can not get a clear conception from this reply either of the nature of Boas's report of 1910 or of the salient points of my criticism of it, I venture to call attention to the following statements:

Professor Boas in his report of 1910 ignores all previous theories of this most complicated problem (see especially pp. 7, 31, 32, 51) and writes as follows:

> Children born more than a few years after the arrival of the immigrant parent in America develop in such a way that they differ in type essentially from their foreign-born parents. These differences seem to develop during the earliest childhood and persist throughout life. It seems that every part of the body is influenced in this way; and even the form of the head, which has always been considered as one of the most permanent hereditary features, undergoes considerable changes. . . . The importance of this entirely unexpected result lies in the fact that even those characteristics which modern science has led us to consider as most stable are subject to thorough changes under new environment. (This is quoted in the "Introduction" to the Report.)

> The head form, which has always been consid ered as one of the most stable and permanent characteristics of human races, undergoes far-reaching changes due to the transfer of the races of Europe to American soil (p. 7).

> This fact is one of the most suggestive ones discovered in our investigation, because it shows that not even those characteristics of a race which have proved to be most permanent in their old home remain the same under our new surround-

[1] Published in the *American Anthropologist*, XIII., 1911, 394–436.

[2] April 5, 1912, 537–40.

ings; and we are compelled to conclude that when these features of the body change, the whole bodily and mental make-up of the immigrants may change (p. 8).

The influence of American environment upon the descendants of immigrants increases with the time that the immigrants have lived in this country before the birth of their children (p. 9).

The influence of American environment makes itself felt with increasing intensity, according to the time elapsed between the arrival of the mother and the birth of the child (p. 17).

The type of the immigrants changes from year to year, owing to a selection which is dependent upon the economic conditions of our country. This is shown by the fact that after the panic of 1893 a sudden decrease in the general development of immigrants may be observed, which persisted for several years. A similar change seems to have taken place after the panic of 1907. (Here Boas gives his Table VIII. and Fig. 17, which includes stature, length of head, width of head, cephalic index, and width of face—showing the "general deterioration" in the type of immigrants after the panic of 1893; pp. 28–29.)

That there are not only decided changes in the rate of development of immigrants, but there is also a far-reaching change in the type—a change which can not be ascribed to selection or mixture, but which can only be explained as due directly to the influence of environment. This conclusion has been tested, and in many different ways, and seems to be amply proved. It has been stated before that, according to all our experiences, the bodily traits which have been observed undergo a change under American environment belong to those characteristics of the human body which are considered the most stable (p. 32).

A feature that is particularly noticeable is the general drop of all the absolute measurements after the year 1894. An attempt to combine all the material, adult and children, for these years, brings out the sudden drop after 1893 even more clearly, and a similar phenomenon is repeated between the years 1907 and 1909. For this reason I am inclined to believe that the type of immigrants is directly affected by financial panics (p. 39).

It would seem that the effect of American environment takes place almost immediately after the arrival of the parents (p. 43).

I think, therefore, that we are justified in the conclusion that the removal of the east European Hebrew to America is accompanied by a marked change in type, which does not affect the young child born abroad and growing up in American environment, but which makes itself felt among the children born in America, even a short time after the arrival of the parents in this country. The change of type seems to be very rapid, but the changes continue to increase; so that the descendants of immigrants born a long time after the arrival of the parents in this country differ more from their parents than do those born a short time after arrival of the parents in the United States (p. 52).

In addition to that I may cite also Boas's explanation of his Fig. 17.

The most striking feature of the diagram is the general decrease in all measurements (viz., stature, length of head, width of head, cephalic index, width of face) in the period following the year 1894, which indicates that the arrivals during the period following the panic of 1893 were underdeveloped in every direction. The increase in the cephalic index during the same period does not contradict the data contained in the other curves (*i. e.*, curves for stature, length and width of head, and width of face), because the index is not an absolute measurement, but the ratio between length of head and width of head. A preliminary tabulation of the measurements after 1907 shows a similar decrease to the one noted here. This decrease is perhaps due to the panic of 1907 (p. 29).

I ventured to characterize this theory as "*environmental-economic*"; and then pointed out that it is untenable, because of many biological and methodological inaccuracies. Not desiring to repeat my former discussion here, I refer the reader to my critique in the *American Anthropologist.*[3]

In this connection I may call attention to a criticism of the same report by the well-known Italian anthropologist, Professor G. Sergi, of the University of Rome, entitled, "The Pretended Change in the Physical Forms of the Descendants of Immigrants in America" (reprint from the *Rivista Italiana di Sociologia,* Jan.–Feb., 1912). He says:

The numerical series, the diagrams, the claims, the seriousness of the New York anthropologist (Boas) lend credit to the conclusions above men-

[3] Op. cit., 1911, pp. 394–436.

tioned (viz., Boas's conclusions), to the great surprise of many anthropologists, some of whom have expressed their incredulity. Not having seen any criticism of Boas, but sounds of retraction on the part of Boas himself, I wish to show how the method which he followed is inexact, and why we can place no faith in his surprising conclusions (p. 4).

Professor Sergi confines himself to the cephalic index, but he rightly says that what is true of the form of the head is equally true of the other data. He continues:

If we consider the other physical forms of the descendants of immigrants, our conclusion acquires a wider and more general significance, viz., that no change of human physical characteristics through the influence of environment has been proved. If, as a matter of fact, there is no change in the physical forms of immigrants in America, the process according to which this change must have theoretically come about is an absurd one (p. 10).

The main points of my criticism of Professor Boas's report of 1910 refer not to classification of the cephalic index, but to the *causes* of its changes. The conventional classification of head forms may or may not be irrelevant. My critique did not treat this problem at all; it only recalled to Professor Boas the fact that he uses familiar technical terms such as "type," "longheaded," "short-headed," which everybody knows but which do not agree with his figures or tables. He says:

The east European Hebrew who has a very round head, becomes more long-headed; the south Italian, who in Italy has an exceedingly long head, becomes more short-headed (p. 7); that the long-headed foreign-born Italians become more short-headed in America (p. 51).

In regard to the cephalic index Professor Sergi, after presenting a table on page 7 of his critique, says:

If we examine the averages (media) of the cephalic index, we doubtless find that for those born in America there is a diminution of from one to two units (or a little more) as compared with those born outside of America. It is this which Boas has shown in his numerous tables. But does this diminution in the averages show, as Boas pretends, a change in the form of the skull of Jews born in America? Apparently, yes, but in reality, no; because the averages are simply the rude expressions of the composition of the series (p. 7).

That Professor Boas's many sweeping conclusions on the form of the head are based on averages only is shown throughout his report (see especially, pp. 8, 43, 9, 12). Dr. Sergi is right in saying:

The series vary in their composition as might be expected and the averages do not give the character of the composition. In fact these would seem to indicate that certain groups are more and others less brachycephalic while the truth is, that some groups contain more brachycephalics (p. 6).

On p. 8 Professor Sergi gives a comparison and concludes that the real result of it is that only the proportions of the classes are altered; and therefore while they exist in different proportions, there still exist dolichocephalics, mesocephalics, brachycephalics and hyperbrachycephalics among those born in America. Therefore this difference of proportion of the classes can not be said to depend on the change of the form of the skull, but upon the paternal and maternal ancestry, the Jews being immigrants from every part of Europe. Boas does not say from which group his subjects come. In other words, they are the children of every European nationality to which the Jews belong (p. 8).

On p. 10 Dr. Sergi says:

But Boas would have us also believe that the children of immigrants who live in America ten years or longer undergo a more distinct and pronounced change, while the parents undergo none whatever. We should then have to suppose that a general change must have been going on in the organism of the immigrants which modified their generatric cells, the ova and the spermatozoa, so that in the embryonal and later development the organism of the children appears modified in form. Who can support such a theory? It appears even more absurd inasmuch as it operates in two directions opposed to each other, the brachycephalics seemingly tending toward dolichocephaly (*i. e.*, with the Jews), and the dolichocephalics tending toward brachycephaly (the case of the Sicilians), by virtue—says Boas—of the environment. The change in the generatric cells of immigrants would have to follow in two opposite directions, being most rapid (according to Boas) in the immigrants

of any year and a little less rapid in those of ten. . . . Admitting the theory of the inheritance of acquired characteristics as proven, a change would have to appear in the parents after a long stay in the United States, and this change would have to be transmitted to the descendants; *i. e.*, the cephalic, facial and other forms would first change in the parents and would then be transmitted to the children. But this is not the case; according to Boas such a change appears *ex novo* in the children as soon as the parents land in America or have lived here a year or two. This is absurd in theory and as a matter of fact these are not the conditions, as I have shown.

Finally, Dr. Sergi says that one is tempted to ask:

> Why should the two types tend toward a common form in America? Is it because one finds there one fixed type, either absolutely dolichocephalic or decidedly brachycephalic? Not even such a justification exists, because America, both with regard to her natives and her immigrants, has always had dolichocephalics, mesocephalics and brachycephalics; hence there is no influence of environment which can tend to fix a single cephalic form in either natives or immigrants (p. 11).

The general reader ought to know these facts. The main purpose of my critique, as well as that of the present discussion, is not to answer but to raise the questions in regard to the causes of changes of the cephalic type. Whatever the *prima facie* explanation may be, the causes of the shape of the head can not be solved by Boas's new theory, because it is, as I showed in my critique, "based rather on a cross-section of the facts than on a genetic interpretation of them. It is only a genetic description and explanation of them that can give a trustworthy basis for a theory." Is it not a fact that in a considerable part of present-day anthropological, psychological and pedagogical writings one is led to think that the most primary phenomena have been examined with mathematical accuracy, when as a matter-of-fact there must have been left out of account numerous accompanying conditions which determined, to a greater or less extent, the results of the problem studied.

The main objection to Professor Boas's new theory of the changes in bodily form of descendants of immigrants in America is that it finds only one causal relation, viz., that between figures and environment, ignoring all biological and methodological factors. He does that in spite of the most recent attempts of biologists to explain all organic and inorganic changes by the principles of "plural effects" and "the limits of possible oscillations" (see especially Petrunkewitsch's "Gedanken über Vererbung," Freiburg, 1904). These modern biologists support their theories also by the logic of mathematics; so, for example, the formula comprising the ellipse, the parabola and the hyperbola (where r and $\blacktriangle$ are polar coordinates):

$$r = \frac{ep}{\not 1 - e \cos \blacktriangle}$$

is capable of many solutions and thus creates many possibilities. I believe that Professor Sergi is perfectly warranted in characterizing as "absurd" an anthropological theory which claims that human bodily forms are plastic and can be moulded even during the "first generation" and "a short time after the arrival of parents under new surroundings."

To sum up. As the general reader knows, the form of the head is considered by anthropologists as the most unchanging physical characteristic of the human body, so that the scientists classify the race into a few cephalic types. Professor Boas, on the contrary, makes unwarranted, sweeping conclusions that even the shape of the head undergoes far-reaching changes in type due to the new environment, a new theory which is not justified by his own figures and is not based on scientific methods and on the required technique of experimental physical anthropology.

Paul R. Radosavljevich
New York University,
April 18, 1912

SCIENTIFIC BOOKS

Pflanzenphysiologie. By W. Palladin. Berlin, Julius Springer. 1911. Pp. vi + 310, figs. in text 180. Price M. 9, paper M. 8.

The new plant physiology from the hand of

Dr. W. Palladin possesses a number of somewhat novel features that will be sure to render it interesting to those dealing with the fundamental principles of physiological science. The present German edition is a translation of the sixth Russian edition of the work, with alterations and additions.

The general view-point of the author and the mode of treatment which characterizes his work are well indicated in the first sentence of the introduction, wherein it is pointed out that the aim of plant physiology is to gain a complete and thorough knowledge of all the phenomena occurring in plants and ultimately to interpret these in terms of the principles of physics and chemistry. From this it may be expected, and it is indeed true, that the present work contemplates plant phenomena more from the standpoint of chemistry and physics than does any one of the already existing treatises on plant physiology.

The book before us is divided into two parts, the first (206 pages) on Nutrition and the second (95 pages) on Growth and Development. The eight chapter headings of Part I. are as follows: (1) Assimilation of Carbon and of the Energy of Sunshine by Green Plants, (2) Assimilation of Carbon and of Energy by Plants without Chlorophyll, (3) Assimilation of Nitrogen, (4) Absorption of Ash Constituents, (5) Absorption of Materials, (6) Movement of Materials in Plants, (7) Material Transformations in Plants and (8) Fermentation and Respiration. In the fourth chapter heading, logic would require the word *assimilation* instead of *Aufname* (absorption) for the latter word occurs, as *Stoffaufname,* in the fifth heading and the ash constituents are surely materials. The chapters of Part II. are entitled as follows: (1) General Conceptions of Growth, (2) Growth Phenomena Dependent on Internal Conditions, (3) The Influence of the Environment on Growth and Development, (4) Tendril Climbers and Twiners, (5) Movements of Variation [not due to growth], and (6) Development and Reproduction.

In Part I. the treatment is primarily chemical, and it is in respect to the chemical phenomena of physiology that Palladin's book will prove most useful. In the fifth and sixth chapters, dealing with physical matters, the discussion is not as thorough as in the others. Chapter VI., for example, on the movement of material in the plant, contains no mention of H. H. Dixon's excellent and thoroughgoing study on the ascent of the transpiration stream, although the commonly cited experiments of Böhm and of Askenasy (demonstrating the great cohesion of water and the adhesion between it and mercury) are adequately presented. The discussion of root pressure, exudation and guttation is far less complete than that of many chemical processes of which we have no more adequate knowledge than we have of these, and the theoretical consideration of these fundamental occurrences is dismissed with the mere remark that "the causes upon which these phenomena depend have as yet not been determined" (p. 136). The matter of acid secretion (gland action in general) does not receive attention.

It is interesting to note that the toxic substance theory of soil fertility is given due consideration (p. 98 *et seq.*), and that, in this connection, a figure from a U. S. Bureau of Soils Bulletin and one from Dachnowski's recent studies on the toxicity of bog water are reproduced.

The growth of our general conceptions of respiration and related processes in organisms has recently been evidenced by a gradual bringing of the subject of fermentation into more and more intimate relation with so-called normal respiration. Palladin, once for all, places the whole matter upon a proper logical basis by opening the discussion with fermentation and following with the other topic. This, the reviewer thinks, is a marked advance in logical presentation, and it may do much toward clearing away the haziness which so generally obscures the whole subject of plant respiration.

The first two chapters of Part II. present, in an unusually concise manner, the main principles which underlie growth phenomena in general. The third chapter comprises general

but exceptionally complete discussions of the main relations between growth and the environmental factors. Nevertheless, the treatment of the influence of temperature lacks any mention of the conception of the temperature coefficient of growth activity, the chemical principle of Van't Hoff and Arrhenius as recently applied to physiological phenomena, although the author emphasizes the point that the phenological method of summer temperatures for the growing period can not be expected to give anything but the crudest of indications regarding the temperature relation of plants. It seems that enough has already been accomplished with the Van't Hoff-Arrhenius principle to warrant some treatment in a work of this kind. In the section on the influence of light, Palladin points out, as he has done before in the literature, that many of the developmental phenomena which are usually ascribed to light conditions should rather be referred to those of moisture. "All the characteristics of the development of etiolated plants may be explained by the altered transpiration conditions of these plants and by the resulting correlative influences of the individual organs" (p. 257).

In the last chapter of the book the author very happily presents the modern theory of internal secretions (developed from work with animals) as the basis of the physiological control of growth. "Hormones must doubtless also exist in plants." "The various phenomena of growth and of plant form will surely prove to be dependent upon different hormones" (p. 300). Such predictions, together with the activity of animal physiologists in this direction, can hardly fail to exert an accelerating influence upon the development of plant physiology.

In a general way, as clear and readable a book on this subject has not previously appeared. The style is always simple and nearly always characterized by strict logical sequence. The volume is almost without teleological implications, though the purist on this subject may smile at such an obsolescent section heading as, "The Necessity for the Movement of Materials" (p. 122), and the exposition thereof, which indicates that *necessity* here means *need* and not *cause*. Such must be regarded as mere slips into hitherto common and now more or less stereotyped modes of expression frequent in biological literature. The more fundamental principles are developed by the historical method, at once placing before the reader the present status of any given question and the names and methods of the workers to whom that status is due. Citations of literature are numerous, but not too numerous, and the western reader will be gratified in finding here a source for references and digests of some of the more important contributions not commonly cited in German, French and English works of this character.

On the whole, the reviewer is inclined to place Palladin's work at the head of the rather short list of books suitable to be placed in the hands of elementary students of plant physiology.

Burton E. Livingston
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Fourth Report of the Wellcome Tropical Research Laboratories at the Gordon Memorial College, Khartoum. Vol. *A*, Medical, 404 pp., 23 pls., 118 figs. in text. Vol. *B*, General Science, 333 pp., 20 pls., 101 figs. in text. Andrew Balfour, M.D., Director. Published for the Department of Education, Sudan Government, Khartoum, by Bailliere, Tindall and Cox, London; Toga Publishing Co., New York City, agents for the United States.

These two highly specialized and elaborately illustrated volumes are filled from cover to cover with the results of research of high order. They are an epitome of the peaceful and effective conquest of the Sudan by the forces of modern science, of biology and chemistry, applied to the problems of the desert and the jungle in the tropics among a people submerged in ignorance and superstition and sunk in racial lethargy. The army of occupation is small, the staff of these laboratories numbering but eleven, including two officers, Captains Archibald and Fry, detailed

from the Egyptian army, and the Arab junior clerk. But the losses are heavy, for peace in the tropics claims its victims no less than war, in fatalities and sick leaves. The heavy loss to the laboratory caused by fire was promptly made good by the patron of the institution and its work has increased greatly in variety and magnitude in recent years.

This is noticeable in the accessions of volunteer helpers, Dr. Stevenson and others, and in applications for opportunity to work in the laboratory far exceed its facilities. The extensive work of this institution is carried up and down the Nile and its tributaries by the ubiquitous laboratory steamer *Culex* and by a floating laboratory equipped for researches remote from Khartoum.

For the first time the term "tropical" is added to the official title of the institution. This is particularly fitting, not only from the location, 15° 30′ N., but also because this is the last outpost of civilization at the river gate to tropical Africa. It is also a natural center for the attack upon the problems which inhere in a desert environment and arise when man tames it by irrigation.

The medical volume is in large part devoted to tropical diseases of man, but likewise contains a number of important studies in bacteriology, protozoology, sanitary problems, and in that field of constantly increasing importance, comparative pathology. Lieutenant Colonel Mathias, president of the Sleeping Sickness Commission, reports upon the measures taken to check that great plague by segregation of sick natives in fly-free camps, clearing vegetation at all fords along the automobile road, and the introduction of treatment of the disease by atoxyl, metallic antimony and Ehrlich's "606."

Animal trypanosomiases of the Sudan are discussed by Captain Fry in a very able manner. He notes that the natural conditions of this country tend to group both animal and human life in isolated colonies and hence to develop apparently isolated types of diseases which alter the virulence and characteristics of the trypanosomes which cause them. He accepts as the most reliable method of differentiation the use of frequency polygons based on careful measurements of comparable preparations of the organisms, preferably from similar culture animals. This morphological basis in his opinion is more trustworthy than animal inoculations and reactions, culture, carrier, or the reaction to drugs, as a means of specific distinction.

An endoglobular developmental stage in the red-blood corpuscles similar to that found by Dr. Chagas in Brazil for *Schizotrypanum cruzi* is reported by Mr. Buchanon for *Trypanosoma brucei*. Captain Archibald has discovered human botryomycosis in the Sudan, the occurrence of acid-fast bacilli like *B. tuberculosis* in the lungs of the camel, and a new form of cutaneous leishmaniosis.

The work of the director, in addition to the heavy routine of administration, has included a study of the peculiar "infection granules" of fowl spirochætosis including the life history of the spirochæte in the ticks which serve as vectors. These results have important bearings on African tick fever and other spirochætal infections of man. The specific relations of the spirochæte of human tick fever at Khartoum to *Spirochæte berbera* of Algiers is definitely established by Dr. Balfour. From his pen also comes a most useful paper on the fallacies and puzzles met with in a blood examination in the tropics and elsewhere, with a colored plate displaying the pitfalls which await the novice who searches for blood parasites, into which forsooth some experienced workers have been entrapped. A coccal form of the diphtheria bacillus is recorded from Khartoum, and Leishman nodules or non-ulcerating "oriental sores" are for the first time described.

An illuminating picture of sanitary administration is afforded in the director's account of "Some Aspects of Tropical Sanitation" in which is revealed not the militant hygiene of Panama, but another type of sanitary tyranny adapted to the life of an ignorant and fanatical people. To wage a successful war against conditions which tend to slay the white man and the black what is required is "education, such legislation as will crush the cul-

tured but ignorant fanatic and aid the worker, a devotion to the cause, and a well-trained band of helpers." In the Sudan where for many years smallpox was a dread calamity, it is now well-nigh as extinct as the dodo. The native is convinced of the beneficent results of Jenner's discovery and the anti-vaccinationist has not yet raised his voice in the desert.

The water supply of towns in the tropics and the bacterial standards to be enforced are discussed at length, with the general conclusion that the conditions are utterly different from those of civilized lands of temperate climates so that the problem of standards must be worked out anew in the tropics. Despite Clemesha's conclusions from analysis in India where soil contamination is great and sewage in streams relatively small, that the use of *Bacillus coli communis* in wider elastic sense as an indicator of contamination of water supplies in the tropics is inadequate and misleading, Dr. Balfour still concludes that this criterion gave useful results in detecting contamination in the municipal supply at Khartoum.

The second volume, devoted to general science, contains a wider range of articles, from a treatise on municipal engineering in the tropics by members of the staff of Gordon Memorial College, to a treatise on the venom of the spitting snakes of Rhodesia and the Sudan. Here are the reports of the staff chemist, Dr. Wm. Bean, and the entomologist, Dr. H. H. King, the former dealing with soil analysis, gum production, hashish and native poisons, and the latter treating of the insects destructive to crops, mosquito control and the relation of birds to insects. Experiments in exterminating mosquitoes in irrigation ditches by a small minnow of similar habit to "Millions" of the Barbados, known as *Cyprinodon dispar,* have been successful. Other biological papers deal with the mosquitoes, birds and scorpions of the region.

The anthropological interests are represented by an account of the ancient gold mines of the Sudan by Mr. S. C. Dunn, government geologist. The Turin papyrus (14th century B.C.) describes these mines and is accompanied by the oldest maps in existence. The cult of the Nyakang and the divine kings of the Shilluk peoples are investigated by Dr. C. G. Seligmann. The king is killed when old age or sickness threatens. Captain Anderson gives an interesting analysis of the tribal customs in their relation to medicine and morals of the Nyam Nyam and Goor peoples of the upper Sudan.

These two volumes are full of varied information, much of it of great interest and promise of permanent value. It is magnificently suggestive in its portrayal of the warfare of science on the firing line of civilization and full of incentive to the reserves at the rear.

Charles Atwood Kofoid
University of California

A History of the Birds of Colorado. By William Lutley Sclater, M.A. (Oxon.), M.B.O.U., Hon. M.A.O.U. (lately Director of the Colorado College Museum). With 17 plates and a map. Witherby & Co., 326 High Holborn, London. 1912. 8vo. Pp. xxiv + 576. For United States, $5. Edition limited to 550 copies.

This is a well-planned and thoroughly up-to-date manual of the birds of Colorado, printed on light-weight paper, and, though a bulky volume of 600 pages, is easy and comfortable to handle. The work is based primarily on the collection of Colorado birds formed by Mr. C. E. Aiken during the last thirty-five years, recently acquired by the late General William J. Palmer and presented by him to the Museum of Colorado College, of which the author of the present book was recently for some years the director.

The introduction deals briefly with the physical features of Colorado, and contains an analysis of its bird fauna, with (1) respect to the season of occurrence of the species and (2) their distribution in the state with respect to altitude. Of the 392 species thus far recorded, about 17 per cent. are resident throughout the year, while the summer resi-

dents form about 30 per cent., the remainder being transient visitors in winter, spring and fall, of which about 106 species are of merely casual occurrence, with only from one to half a dozen records within the state for each.

The nomenclature and classification adopted conform to the third edition of the A. O. U. Checklist, which renders unnecessary the citation of original references for the genera and species. The author has also adopted a concise method of citing the Colorado references under each species, where the name of the author, an abbreviated date and a page reference direct the reader to the full title and place of publication of the paper given in the bibliography near the close of the volume (pp. 532–551), which mentions every publication of importance relating to Colorado ornithology up to December, 1910. This is followed by a gazetteer of the localities specially mentioned (pp. 553–562). With the keys to the higher groups, genera and species, the very satisfactory descriptions, the notes on distribution and habits, the author has succeeded in providing an admirable handbook of Colorado ornithology. Although there are here and there a few minor slips, the work bears the earmarks of a practised hand, and shows a thorough mastery of the subject, although the author's sojourn in Colorado was a comparatively brief one and his personal experience with Colorado birds thus necessarily limited.

The work is dedicated to his friend and patron, the late General Palmer, whose portrait forms the frontispiece of the volume. The half-tone plates illustrate the nesting habits of a number of interesting species, from photographs by well-known Colorado ornithologists. A contour map shows the principal streams, the counties and county-seats of the state, and indicates on a small scale the diversity of altitude and physical features.

J. A. A.

BOTANICAL NOTES

THE GARDEN IN EDUCATION

DORA WILLIAMS has done a good thing in writing a little book on "Gardens and their Meaning" (Ginn), and doing it in such an attractive way that its reading is certain to accomplish what the author desired, namely, "to show the importance of science in the use of spade and hoe, and to urge that a garden for education may be, not merely in substance, but in spirit, a corner of the great world." A serial citation of the headings of the thirteen chapters will develop the topic, while at the same time giving the substance of the author's message. Thus we find headings as follows: What Makes a School Worth While? Little Studies in Cooperation; Situation and Soil; Plotting and Planning; A Word for Good Tools; Planting; The Art of Making Things Grow; Just How; Garden Foes and Garden Friends; Side Shows; New Life in Old Subjects; The Young Farmer's Almanac; The New Agriculture. The reader who knows something of the place of the garden in education can easily fill in most of these chapter headings, but few can do it in such enthusiastic words and such a genuine spirit of helpfulness and hopefulness. Her closing sentence may well be quoted as giving the purpose of the book:

> Gardening, then, worked out at school after some such plan as has been sketched in these pages, will be a powerful lever to raise agriculture —rightly viewed the most rewarding of occupations—from the humble plane, where it has long remained, to the heights which it is destined to command.

The book is evidently designed for adults and the older only of the school children. It should be widely read and discussed in the "reading circles," especially those composed of earnest teachers, where it should do much good. One is tempted to suggest that the author should now write a complementary book for the children, a difficult task, but one for which she appears to be well fitted.

AN ISLAND FLORA

ABOUT seven years ago the California Academy of Sciences sent a scientific expedition to the Galapagos Islands (500 to 600 miles west of Equador), one of the incidents of which was an eleven days' visit to Cocos Island about midway between Costa Rica and the archipel-

ago. The botanical results of this visit are now published by Alban Stewart, botanist to the expedition,[1] which has just appeared under date of January, 1912.

The island includes between eight to ten square miles and rises often abruptly from the water, culminating in a mountain cone 2,788 feet high, evidently volcanic, but now heavily covered with a dense vegetation. The rainfall is abundant, and the temperature ranges from 68° to 92° F. Near the shore are coconut trees, but no mangroves, "possibly because of the absence of quiet bays and lagoons."

> The interior of the island is covered for the most part with rain forests, in which the vegetation is usually so dense that even at midday, with the sun shining, the light is almost as diffuse as at twilight.

The trees are large and tall, reaching a hundred feet or more. "The largest and probably the most important tree from an economic standpoint is one which bears the common name of 'Ironwood'" of which there are trees on the island "so large that timbers $3 \times 3 \times 60$ feet could be cut from them."

In summing up the results of his study of the vegetation of the island the author says:

> The flora of Cocos, like that of the Galapagos Islands, is distinctly that of an oceanic island. The relatively large number of ferns, the much smaller number of species in the remaining families, and the total number of species found on the island lend support to this view. The flora is probably of much more recent origin than is that of the Galapagos Islands. . . . It seems possible that the time that has elapsed since conditions on the island were suitable for the growth of higher vegetation has not been sufficient to stock the island by the slow process of seed dissemination, over considerable areas of water, with as many species as it is capable of supporting. The small number of endemic species on the island might also point to a relatively recent origin of its flora.

SYSTEMATIC NOTES

It is a hopeful sign that from time to time Professor Schaffner brings out papers on the classification of plants, the last of which appeared in the *Ohio Naturalist* for December, 1911. In this he reviews and rearranges some of his previous schemes, and adds a synopsis of the phyla, classes and subclasses of the whole vegetable kingdom. In the latter he recognizes fifteen phyla, viz: Schizophyta, Myxophyta, Zygophyta, Gonidiophyta, Phoeophyta, Rhodophyta, Charophyta, Mycophyta, Bryophyta, Ptenophyta, Calamophyta, Lepidophyta, Cycadophyta, Strobilophyta, Anthophyta. The discussion contains a statement of principles, one of which may well be reproduced here:

> In a word, the whole scheme of classification must show the result which has come about through progressive evolution, segregation, degradation and specialization.

Another paper by Henry Pittier on "New or Noteworthy Plants from Colombia and Central America," in the Contrib. U. S. Natl. Herb., Vol. 13, pt. 12, among other things contains a revision of the Artocarpoideae-Olmediae of the family *Moraceae* which will interest critical systematists. Many good plates and text figures add much to the value of the paper.

In part 1 of Vol. 16 of the same Contributions, we find a critical discussion by W. R. Maxon, of the systematic standing of a Rocky Mountain fern known as *Asplenium andrewsii*, which may turn out to be an Americanized form of the European *A. adiantum-nigrum*.

Accompanying the foregoing is a "Report on a Collection of Plants from the Pinacate Region of Sonora," by J. N. Rose and P. C. Standley, in which are given the botanical results of an expedition from the Desert Laboratory at Tucson in 1907, into a region never before visited by a botanical collector. "The botanical collections, although small, have proved to be most interesting." Eighty-four species are enumerated, of which eleven are here described as new to science. Eight of the plants in the list are Monocotyledons, of which seven are grasses. Ten are Cactaceae, while seventeen are Compositae. The fine plates add greatly to the interest of the paper.

[1] *Proc. Calif. Acad. Sci.*, 4th series, Vol. 1.

Dr. E. L. Greene continues in *Leaflets* (Vol. II., pp. 165–196) the publication of new species from different parts of the country, much space being given to new species of *Apocynum*, of which upwards of forty species are recognized that hitherto have found place under *A. cannabinum* and *A. androsaemifolium*. Half a dozen new species of *Trautvetteria* and five of *Erigeron* complete the fascicle.

Brief notice may be made here of the "Outline Key of the Groups of the Genus *Helianthus* in Michigan," by Mr. S. Alexander, in the Nineteenth Report of the Michigan Academy of Sciences (1911), in which the author brings together for publication some results of his critical studies of these plants in the field and under cultivation. Although incomplete, the paper contains many hints that systematic botanists may well heed.

Dr. A. Nelson's "New Plants from Idaho," in the *Botanical Gazette* for October, 1911, adds a number of new species from southwestern Idaho, a region as yet little known botanically.

Wm. R. Maxon describes (Smithsonian Miscellaneous Collections, Vol. 56, No. 24) "A Remarkable New Fern from Panama," a species of *Polypodium* in which the sori become crowded out so as to appear marginal upon the leaflets. To this species he has given the name *P. podocarpum*, and the hint is thrown out that it may constitute "a distinct generic type."

In M. A. Howe's Phycological Studies, V., in the *Torrey Bulletin* for November, 1911, he publishes a list of nine Chlorophyceae, seven Phaeophyceae, and twelve Rhodophyceae from Lower California, of which eight are new.

From the Institut de Botanique, Université de Geneve, the fifth and sixth fascicles (1910, 1911) contain the usual variety of contributions, ranging from morphology to physiology, pathology and the systematic botany of lower and higher plants, as, a new *Rhamnus*, the green snow of an Alpine glacier (due to *Ankistrodesmus vireti*), the copulation of *Spirogyra*, the physiological rôle of catalase, a new blue-green alga, etc.

The well-known Minnesota Botanical Studies have begun to appear again, the second part of Vol. IV. bearing date of September 15, 1911. Its four articles are "Observations on the Morphology of the Underground Stems of *Symplocarpus* and *Lysichiton*," by C. O. Rosendahl; "Some Effects of Severe Frost upon Vegetation in a Condition of Active Growth," by F. K. Butters and C. O. Rosendahl; "Notes on the Species of *Liagora* and *Galaxaura* of the Central Pacific," by F. K. Butters; "Nova Fungorum Coloradensium Genera," by F. E. Clements, the last including six new genera of Sphaeriaceae. With this part are given title-page, table of contents and index of Volume III.

PATHOLOGICAL NOTES

Dr. C. W. Edgerton's papers "Two New Fig Diseases" (*Phytopathology*, February, 1911), "Diseases of the Fig Tree and Fruit" (Bull. 126, La. Expt. Station, March, 1911), "The Red Rot of Sugar Cane" (Bull. 133, La. Expt. Station, December, 1911), "*Botryosphaeria* on Cotton Bolls" (*Mycologia*, January, 1912), and "Flower Infection with Cotton Boll Rots" (*Phytopathology*, February, 1912), show that botanical activity in the south is bringing good results.

The same thing is shown by J. R. Johnston's "History and Cause of the Cocoanut Bud-Rot" (Bull. 228, Bureau of Plant Industry, U. S. Dept. Agric., February, 1912), dealing with "a very destructive and widespread disease of cocoanuts which has been known to occur in Cuba for more than thirty years." The bulletin is the result of investigations in Cuba, Jamaica, Trinidad and British Guiana, covering a period of four years. The remarkable discovery was made that the organism causing this bud-rot is the common *Bacillus coli*, and "it is believed that birds and insects are the carriers of this disease," but to this the author cautiously adds "the subject requires further study."

MYCOLOGICAL NOTES

THREE papers of much more than usual value in such a publication are found in the *Transactions of the Wisconsin Academy of Sciences, Arts and Letters* (Vol. XVI., Part II., No. 4). The first, by E. M. Gilbert, is entitled "Studies on the Tremellineae of Wisconsin" and includes notes upon twenty-one species belonging to nine genera. Apparently this systematic paper is preliminary to "a further physiological and cytological study of the group." The second paper, "Spore Formation in *Geoglossum glabrum* Pers.," by Hallie D. M. Jolivette, is a careful study of the formation of ascospores, with especial reference to the behavior and significance of the rays of the polar aster. Three fine plates accompany the paper. The longest paper is that by B. F. Lutman, entitled "Some Contributions to the Life History and Cytology of the Smuts." In it the author has reinvestigated the spore-formation and germination of species of smuts belonging to the genera *Ustilago, Doassansia, Urocystis* and *Entyloma* and compared them with *Tilletia* and other well-known genera. He finds that two groups of smuts may be distinguished—"the *Ustilago* group," and "the *Tilletia, Entyloma, Urocystis* division," which, he says, "may be more distantly related than has been commonly supposed." These he characterizes as follows: (1) *Ustilago group,* "simple spores produced by the breaking up of the mycelium; intercellular mycelium without haustoria; typically four-celled promycelium"; (2) *Tilletia, Entyloma, Urocystis group,* spores borne on lateral branches; haustoria; binucleated cells and non-septate promycelium. Eight good plates accompany the paper.

PALEOBOTANICAL NOTES

A CONCISE statement of one portion of paleobotany is given by Dr. J. M. Coulter in the February number (1912) of the *Popular Science Monthly,* accompanied by a helpful chart showing the relationships of the Cycadofilicales, Cordaitales, Benettitales, Cycadales, Ginkgoales, Coniferales and Gnetales.

The same author and Dr. W. J. S. Land published in the *Botanical Gazette* (June, 1911) a short paper (with two plates) on "An American *Lepidostrobus*" in which the structure of a fragment of a well-preserved cone is described from the central Iowa coal measures. This appears to be the first description of an American *Lepidostrobus* cone.

In a pungent note "On the True Nature of the Cretaceous Plant *Ophioglossum granulatum* Heer." in the *Annals of Botany* (October, 1911) Dr. M. C. Stopes shows that instead of being an *Ophioglossum,* the specimen from the Amboy clays is that of a staminate pine cone, and in proof of this conclusion she figures four pollen grains showing the characteristic wings!

An enumeration of the titles of some of the many papers published in recent years by the well-known paleobotanist G. R. Wieland may be helpful to botanical readers who are interested in this portion of botany, and especially in the method of discovery. Thus in the March, April and May numbers of the *American Journal of Science* for 1889 there appeared, under the general title, "Study of Some American Fossil Cycads," papers on "The Male Flower of Cycadeoidea," "Leaf Structure of Cycadeoidea," and "The Female Fructification of Cycadeoidea," showing that at that time he had made much progress in unraveling the puzzle of the old Cycads. Again later (March, 1900) in his paper on the "Yale Collection of Fossil Cycads" (*Yale Scientific Monthly*) he comes so near to the solution that he finds macrosporangia and microsporangia on the same trunk. Then in a fourth paper under the general title of "Study of Some American Fossil Cycads" he returns again (*Am. Jour. Sci.,* June, 1901) to the microsporangiate fructification of Cycadeoidea, and now makes out the structure of the old *Cycad* flower with its ovulate central cone surrounded by a whorl of pinnate stamens! Later came "The Proembryo of the Bennettiteae" (*Am. Jour. Sci.,* December, 1904); "Historic Fossil Cycads" (*Am. Jour. Sci.,*

February, 1908); "Paleobotany" (reviews in *Am. Jour. Sci.*, April, 1908); "The *Williamsonias* of the Mixteca Alta" (*Bot. Gaz.*, December, 1909); "Further Notes on Seed Structures" (*Am. Jour. Sci.*, August, 1911); "The Williamsonian Tribe" (*Am. Jour. Sci.*, December, 1911), and "The Smaller Flowerbuds of Cycadeoidea" (*Am. Jour. Sci.*, February, 1912). In the last is ample confirmation of the author's interpretation of the old Cycad flower structure as announced by him nearly eleven years earlier. These papers, with the author's monumental volume, "American Fossil Cycads" (1906) constitute a remarkable example of the gradual uncovering of facts and their successful interpretation, and combination into a consistent phylogenetic scheme.

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SPECIAL ARTICLES

THE INEFFICIENCY OF WIRES AS A MEANS OF CURING DEFECTIVE ACOUSTICS OF AUDITORIUMS

IN the popular mind, one of the first aids for a hall with poor acoustics is to install a system of wires or strings with the expectation that in some way the defect will be cured. This prevalent idea is doubtless due to the fact that there are many halls where wires have been strung, and people naturally conclude that there must be some merit in the method. As a matter of fact, this popular impression does not seem to be well founded, for the author has inspected a number of halls thus treated, and has found no marked improvement in the acoustics.

Thus in Dr. Parkhurst's church in New York City where a thin network of silk fibers of large mesh was stretched horizontally about half way between the floor and the dome, there still persisted a reverberation and an echo. In the Royal Cathedral in Berlin, a number of silk cords are installed in a horizontal network, yet the acoustics remain very defective. A fishnet is stretched near the ceiling in one of the court rooms of the Berlin Rathhaus with no benefit to the acoustical properties. The Royal Albert Hall in London has a series of wires installed, and, while the acoustics there are improved, other features than wires have unquestionably produced the effect. The warden of a church in Nottingham, England, writes:

> Several dodges were tried to overcome the (acoustical) defect, such as stretching wires across the nave.

And so on for other cases that might be cited.

The conclusions of the author in regard to the inefficiency of wires have not always been in accord with the opinions of the auditors in the various halls mentioned. The janitor of Dr. Parkhurst's church, in answer to the question, "Does the net help the acoustics?" replied, "Some says it does, and some says it don't." In the Royal Cathedral in Berlin, according to the attendant's account, the Kaiser thought the wires produced no improvement while the Kaiserin thought they did. The direct question to the attendant as to his own opinion proved very embarrassing and brought only a shrug of the shoulders. Later conversation, however, revealed his conviction that no help had been rendered. In the majority of cases where opinions were asked for, there was a decided expression against the use of wires—"the acoustics are as bad as before," "The wires have not helped," etc.

Some people, however, claim that the method is advantageous, and that the acoustics are really benefited. The author believes these claims are sincere, but attributes the better hearing to other features than the wires. For instance, the acoustics are usually improved when a large audience is present. Also, the opening of windows produces a good effect. Furthermore, regular attendants in a hall with poor acoustics get used to the defect, and, by an adjustment of the attention, are able in some cases to subordinate the disturbing factors and hear better than before. Thus on one occasion the author fixed his attention on a particularly strong echo and was able to hear more distinctly than by listening to the words

as they came directly from the speaker. On another occasion in this same hall the leader of the band had great trouble in conducting a certain selection. The piece being played was a xylophone solo with orchestra accompaniment. After some time the leader discovered that he was beating time to the *echo* of the xylophone. The players near the soloist kept proper time, the others near the leader played in unison with the echo. The result may be imagined.

While both observation and opinion indicate that acoustical defects are not helped by wires, it is interesting to look for further confirmation from the standpoint of theory. It is well known that if a loud tone is sung near a piano, certain wires of the latter will resound. Perhaps this phenomenon suggested the use of wires in auditoriums, with the hope that the objectionable sound would be absorbed or broken up in some way. But the conditions for the response of the piano strings are very favorable. There are many wires tuned to different pitches, so that certain ones are in tune, or nearly so, with any tone sung, and these are the wires that resound. The wire in the auditorium would respond therefore to only one of the many tones present. To be effective on this score, there would have to be many wires tuned so as to cover a wide range of pitch. Secondly, the piano wire is backed by a sounding board, which absorbs considerable energy and communicates it to the wire. The response is thus very much greater than it would be without the sounding board. The wire in the auditorium has no such sounding board, therefore it absorbs less energy and has less effect on the sound. Finally, the piano occupies a considerable portion of the space of the room and gets energy not only directly, but also by reflection from the near-by walls and ceiling. On the other hand, the wire in the auditorium is small, and is struck by only a small part of the sound waves, direct or reflected, hence has a small chance to help matters. All of these considerations indicate the smallness of the effect to be expected.

One other way in which wires might be beneficial lies in the possible scattering of the sound waves. Here again, however, the small bulk of the wires allows but little effect. The sound waves pass around the wires in much the same way that large water waves on a pond pass by a stake projecting through the surface. It is only when the obstacle has some size compared with the waves that a disturbance is set up. If there were a large number of wires close together, the sound waves would be influenced. In halls, we find usually only a few wires installed, probably with the idea of having them inconspicuous.

From the various considerations mentioned, it is seen that the installation of wires in halls having poor acoustics is without marked effect. While much remains to be done on the problem of architectural acoustics, and though the means of cure can not be specified readily for each case, it is nevertheless of value to know that the installation of wires, as now used, will *not* serve to cure the trouble.

F. R. Watson

Berlin, Germany,
March 6, 1912

Color Variations of the House Mouse in California

While trapping for mice in the vicinity of Palo Alto, California, in November, 1910, a mouse was taken the under parts of which were colored white, as in the common Gambel's mouse (*Peromyscus maniculatus gambeli*), but which on examination, proved to be a house mouse (*Mus musculus*). Since that time, trapping in a number of localities in California by the author and others and search through previously made collections of California mammals have brought to light a considerable number of instances of color variations in the house mouse. So far, only a start has been made in the study of these variations. The meager results at hand are published at this time because the author is leaving California. It is hoped that such publication will direct the attention of students and collectors to the house mouse, an animal that is commonly neglected. Very likely further variations will be found in the same animal from other parts of America.

I am indebted to Professor J. O. Snyder, of Stanford University, and to Professor Joseph Grinnell, of the Museum of Vertebrate Zoology, University of California, for suggestions and for the use of the collections under their charge. To Miss Hilda Hempl, of Stanford University, I am indebted for a considerable number of specimens.

The common house mouse is nearly uniform in color all over. The under parts are a little lighter than the back, but the transition is very gradual. The entire color of the mouse is subject to some variation, both individual and geographic. No attempt will be made here to discuss this variation which affects all parts of the mouse equally or nearly so. We will consider only those variations in color which result in one part of the mouse becoming strikingly different in color from the other parts.

A considerable number of house mice in California have the under parts separated in color from the upper parts. The upper parts retain the color of the common house mice of the region, while the under parts become colored either white, creamy buff, reddish buff, or intermediate tints between these colors and the color of the under parts of the unmodified house mouse. These colors of the under parts, where present, are sharply separated from the color of the back and sides at a definite line. In about half the specimens this line is emphasized by the addition of a narrow stripe of pale fulvous.

In all, seven house mice with white under parts, two with creamy buff under parts and a much larger number with reddish buff under parts have been taken up to the present time. Enough intermediate stages between the various colors have been found so that it becomes certain that these grade into one another and therefore are probably the product of the same factor or factors of variation. What these factors are we can make no attempt to consider with the amount of data at hand. All attempts to correlate these color variations with cranial or bodily differences have been fruitless.

One peculiar specimen shows an oval white spot about one half inch long on the middle of the belly. In every other case noted the whole of the under parts are affected alike. The area covered by the modified color—except in this one instance—is just about the same as the area covered by the white in the common white-footed mouse (*Peromyscus maniculatus gambeli*).

The earliest record of any variation in the color of the ventral surface of the house mouse of California is furnished by a specimen in the Stanford University Museum collected April 3, 1893, by J. M. Stowell at Palo Alto. This specimen shows reddish-buff under parts sharply marked off from the color of the back. During November of 1907, Joseph Dixon took two specimens with white underparts and one with creamy buff under parts at Palo Alto. All other records of specimens with peculiar coloration are for the fall of 1910 and the spring of 1911.

A large proportion of the mice showing the color variations on which this article is based have been taken at Palo Alto and Stanford University. Here a few were found on the salt marshes near San Francisco Bay and the rest in the houses and barns at Palo Alto and on the campus of the university. In some houses all the mice seem to be more or less modified in color, though not all in the same way or to the same degree. In other places most of the mice may have the typical house mouse coloration and only a few show any variation. From a lot of fifteen mice taken in two days at Stanford University, only one showed any considerable variation and this one was white on the belly. Nearly half the mice taken in the region show some modification of the color of the underparts. Besides the region about Palo Alto, house mice showing variation in the color of the under parts have been taken during 1911 at Tipton, Tulare County, at Madera, Madera County, and at Pacific Grove, Monterey County. Of two house mice taken at Tipton, one shows a light creamy-buff ventral surface, while the other has the ordinary coloration of the house mouse. Of eleven house mice taken at Madera in a

barn and along the Fresno River, four had the under parts a dusky white sharply marked off from the color of the upperparts. The other seven had either no modification in color or the modification was very slight. Of four house mice examined at Pacific Grove, three showed pale reddish buff underparts and the other showed no modification. Two house mice taken at Pizmo, San Luis Obispo County, and about fifty taken at Tracy, San Joaquin County, showed no modification. I know of no record of this color modification outside of the state of California.

Besides the modification of the color of the ventral surface, two specimens of house mice from California show the assumption of the dark longitudinal dorsal stripe described by Allen for *Mus musculus jalapæ*. One of these specimens is from New River, Salton Sea, collected by Frank Stephens, and shows a wide dark dorsal stripe with no modification of the ventral surface. Another house mouse from the same locality taken at the same time does not have any indication of the dorsal stripe. The other specimen of the *jalapæ* type is from Madera, Madera County, and in addition to a narrow dark dorsal stripe, has dusky white underparts sharply marked off from the color of the sides so that the color of both back and belly is modified.

These instances seem to indicate that the house mouse is undergoing modification in some localities, and it may be that important results will be obtained by the study of the progress of this modification.

Lee R. Dice

July, 1911

SOCIETIES AND ACADEMIES

THE SECOND ANNUAL MEETING OF THE PACIFIC ASSOCIATION OF SCIENTIFIC SOCIETIES

The second annual meeting of the Pacific Association of Scientific Societies was held at Stanford University, Friday and Saturday, April 5 and 6, 1912. Eight of the eleven constituent societies held sessions: Technical Society of the Pacific, the Cordilleran Section of the Geological Society of America, the Seismological Society of America, Pacific Coast Branch of the American Historical Association, the Pacific Slope Association of Economic Entomologists, Pacific Coast Paleontological Society, Biological Society of the Pacific Coast and the California Section of the American Chemical Society. The other societies were either unable to hold or not desirous of holding sessions at this meeting. With the association met also the San Francisco Section of the American Mathematical Society.

The Astronomical Society of the Pacific was elected to membership in the association. This makes the association represent a membership of over 2,000 persons.

The officers of the executive committee elected for 1912–13 are Otto von Geldern, chairman; George D. Louderback, vice-chairman and J. N. Bowman, secretary-treasurer.

Berkeley was selected as the suggested place for the third annual meeting in 1913; and the suggested time was temporarily placed in the spring of that year—the definite date is to be determined later.

The general session of the association was held on Saturday evening in the chapel of the university. In the absence of President Jordan, Dr. Branner, vice-president, gave the address of welcome. Director William Wallace Campbell, of the Lick Observatory, gave an address on "Recent Studies of the Stellar System." He gave the latest views and theories as based on the observations and work done at Mount Hamilton and elsewhere. Professor Ewald Flügel, of Stanford University, read a paper on "Scientific Lexicography," wherein he traced the lexicographical work from the thirteenth century to the present; he discussed the standards that were used by the Grimm brothers in their work, and which formed the basis of all the later activity in lexicography and raised this subject to the rank of a science. Professor Andrew Cowper Lawson, of the University of California, gave the last address of the session on "Recent Views on the Archæan Rocks of Canada." Twenty years ago he examined these rocks for the Canadian government. Lately his findings and views have been brought into question. Last summer he went over the field again, at the instance of the Canadian government, with the result that he is led to corroborate his former findings and views.

J. N. Bowman,
Secretary

Berkeley, Cal.,
April, 1912